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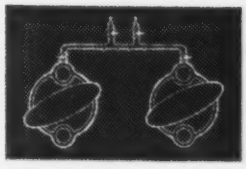

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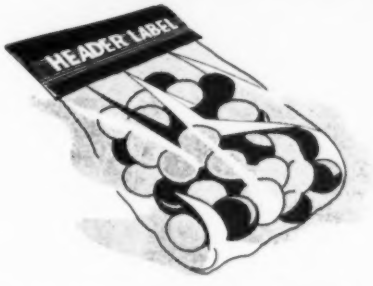

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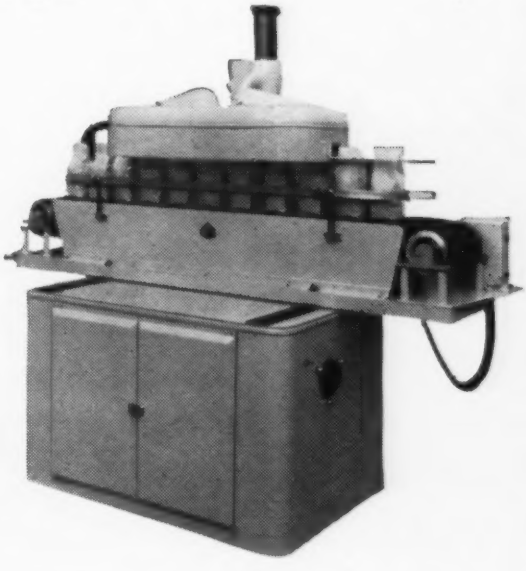

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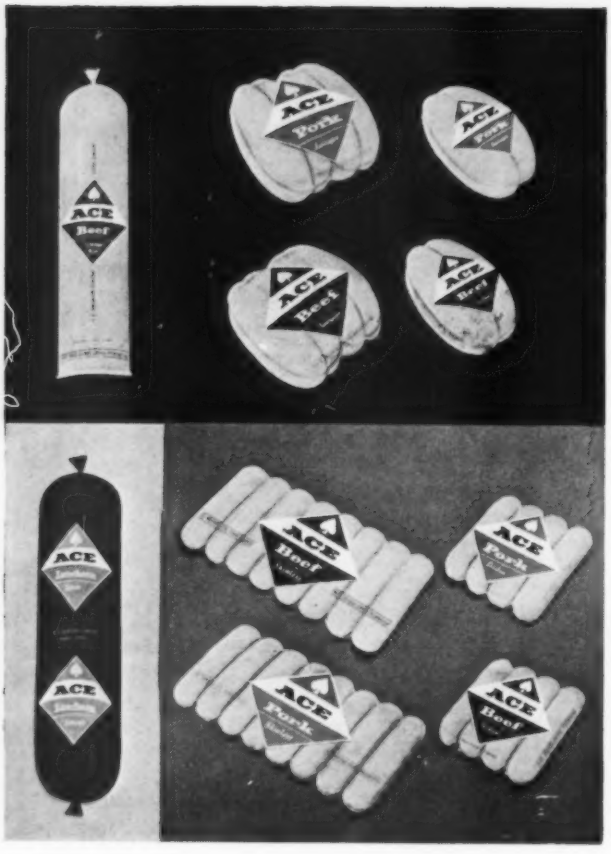

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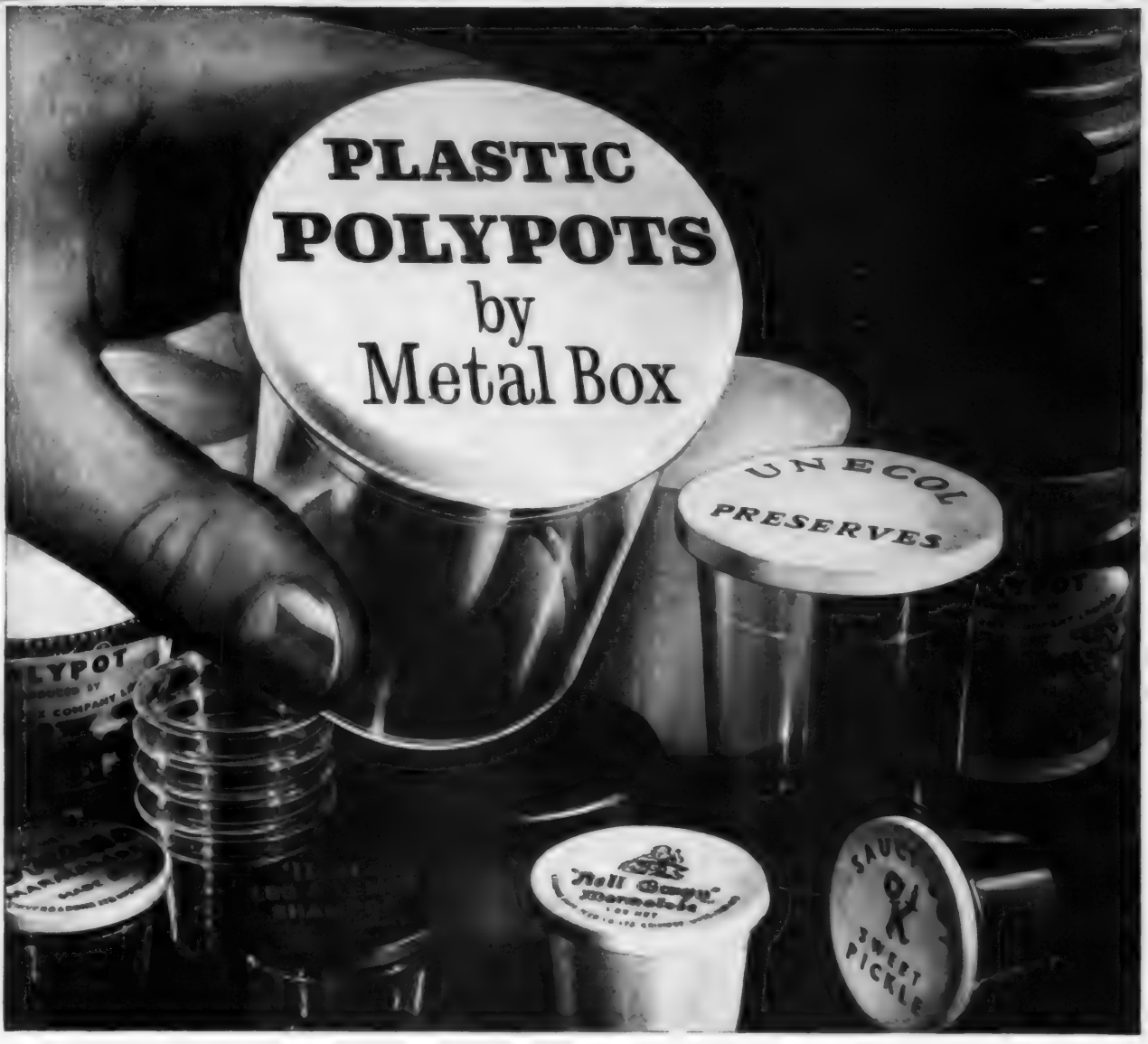

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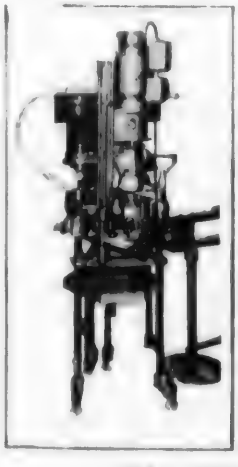

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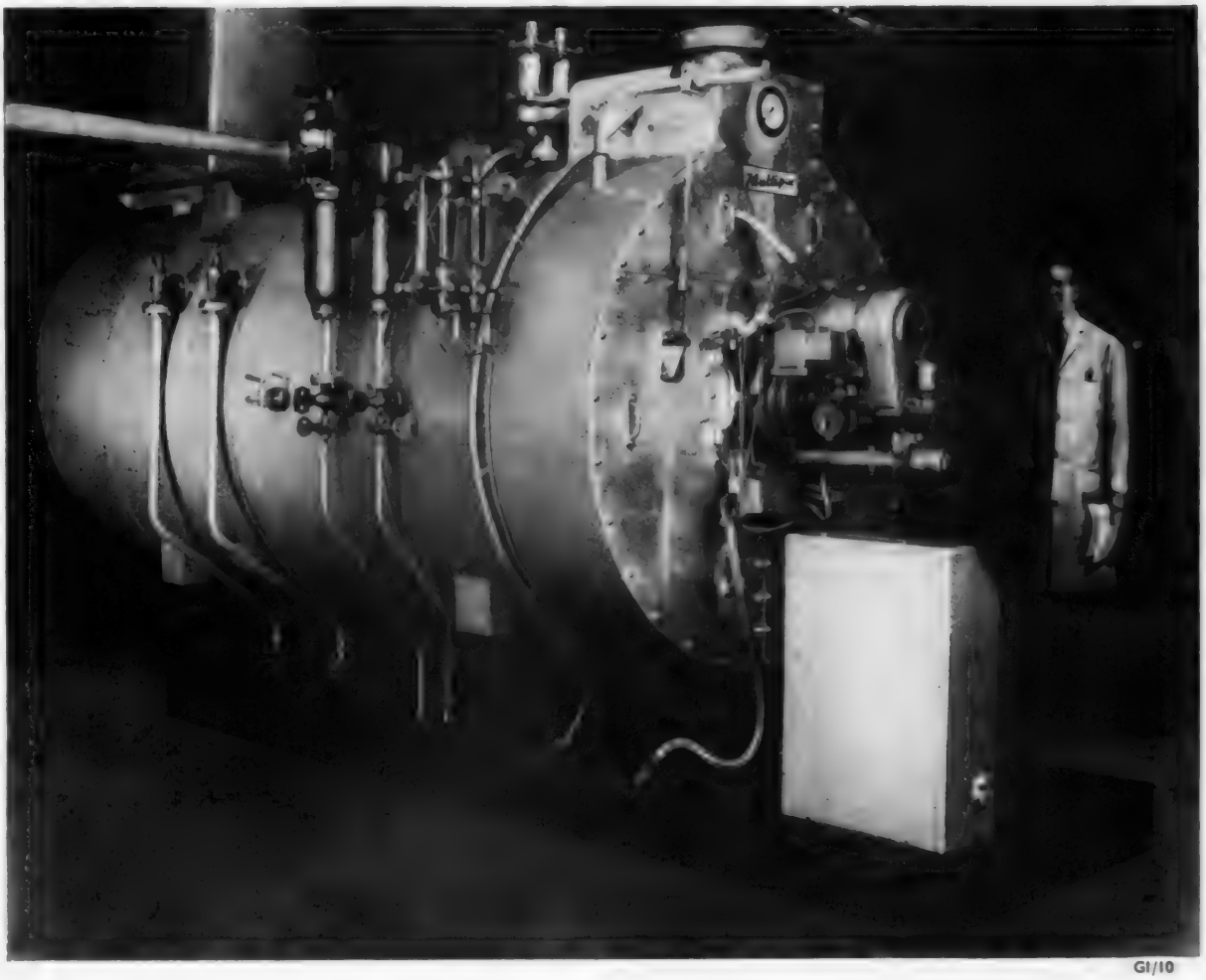

GI/10

Serving Industry

Many famous names in the British Food Manufacturing Industry select B.E.N. Air Compressors and pneumatic equipment to serve them in the manufacture of their products ... and the reason? ... their reputation for reliability and sound performance backed by an efficient after-sales service.

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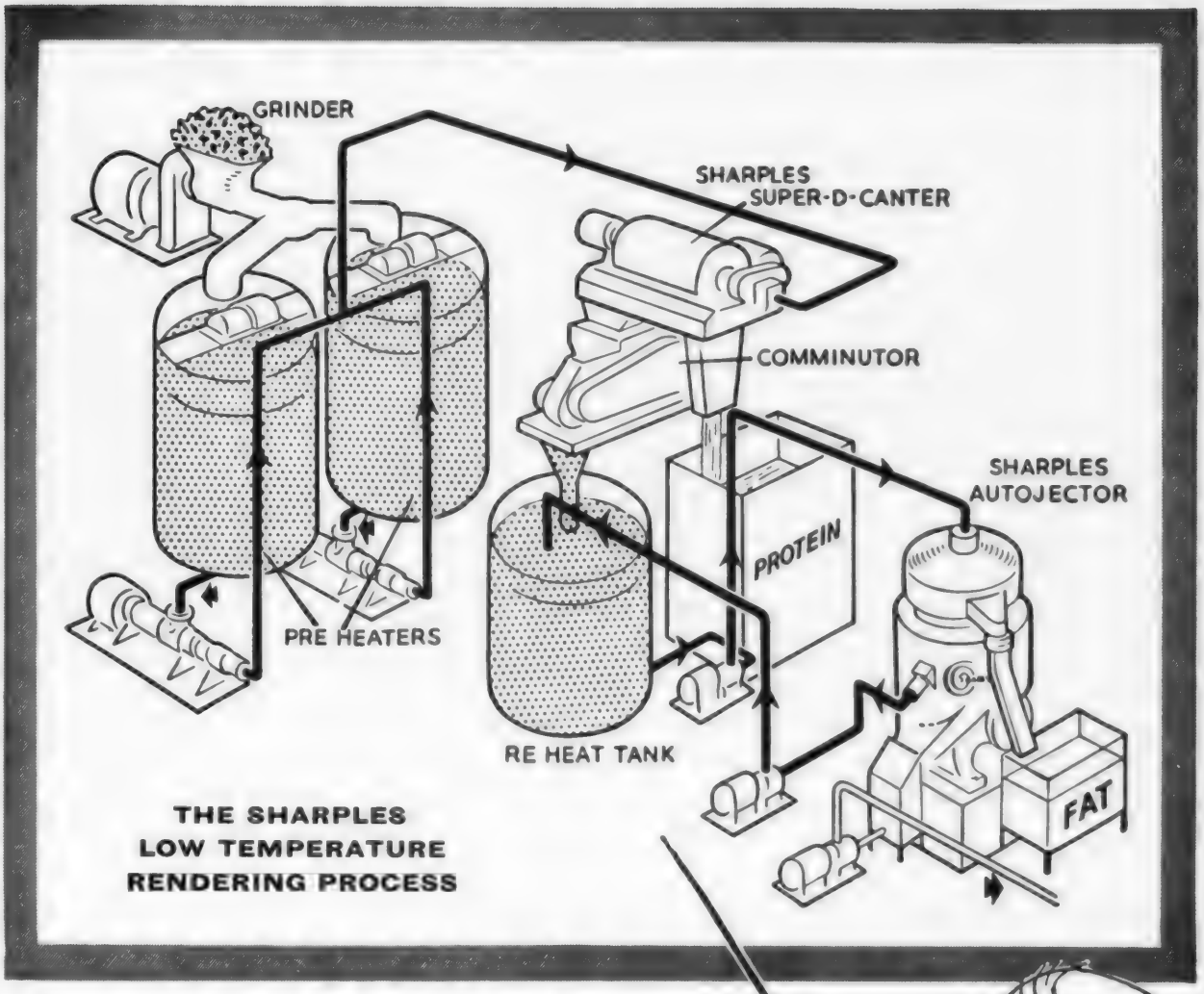

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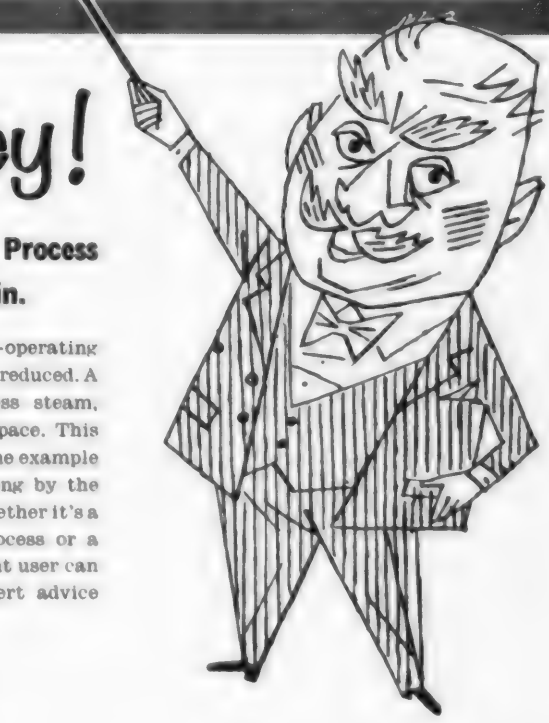
Only the Sharples Low Temperature Rendering Process combines highest quality fat and undenatured protein.

EXPERIENCE from over 40 installations has proved that the Sharples Low Temperature Rendering Process not only produces the highest quality fat but also yields an undenatured protein stream suitable for incorporation in edible products, such as sausage and meat loaf, and also pet foods.

Note for renderers who want to have their cake and eat it: not only does the Sharples Process produce a premium quality fat and protein—operating costs are also considerably reduced. A Sharples Process uses less steam, less labour, less ground space. This Sharples Process is only one example of creative food engineering by the Sharples organisation. Whether it's a matter of a complete process or a single machine, every plant user can avail himself of the expert advice provided by Sharples.



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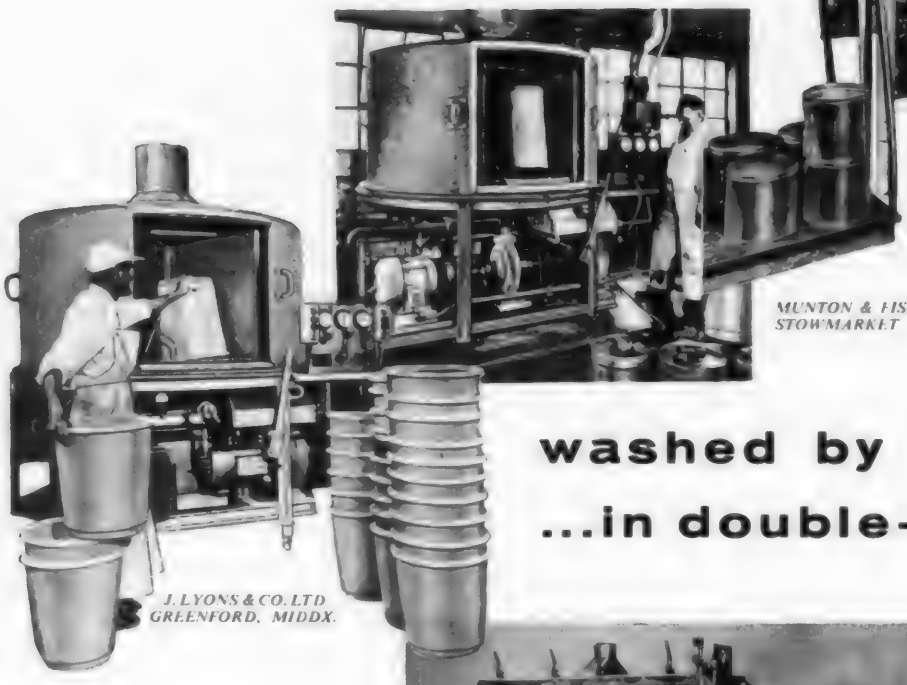

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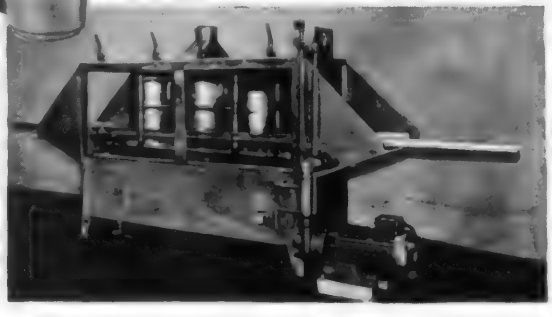

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Hand-fed and Automatic rotary equipment for washing/sterilizing containers at a rate of up to 360 per hour.

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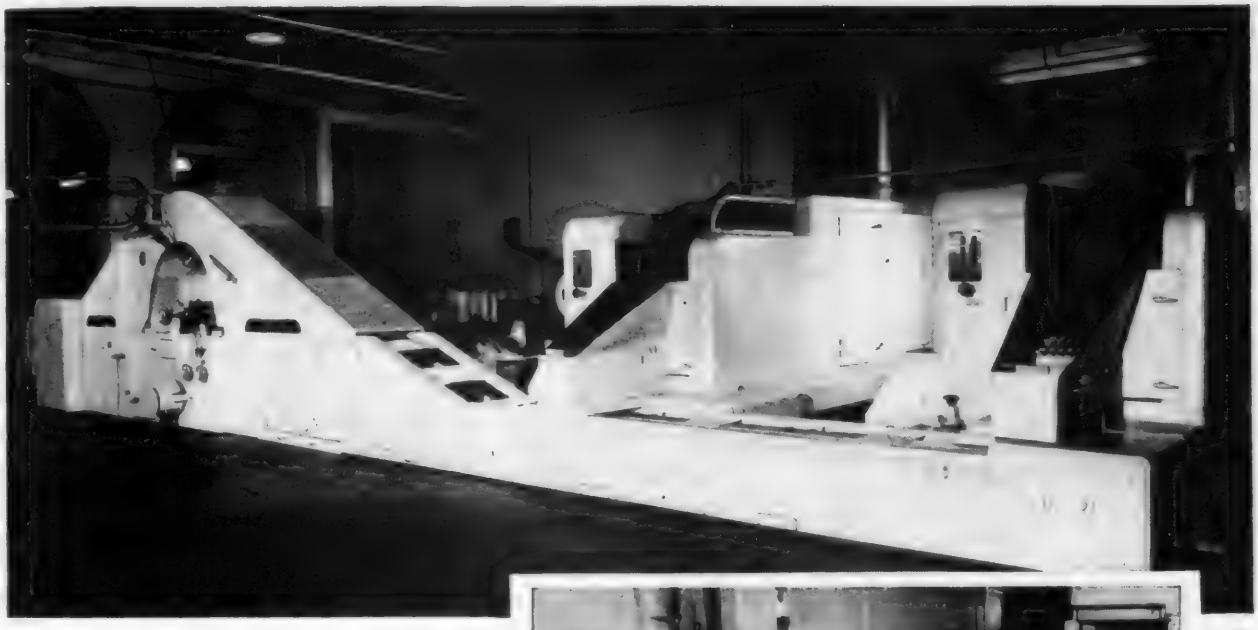
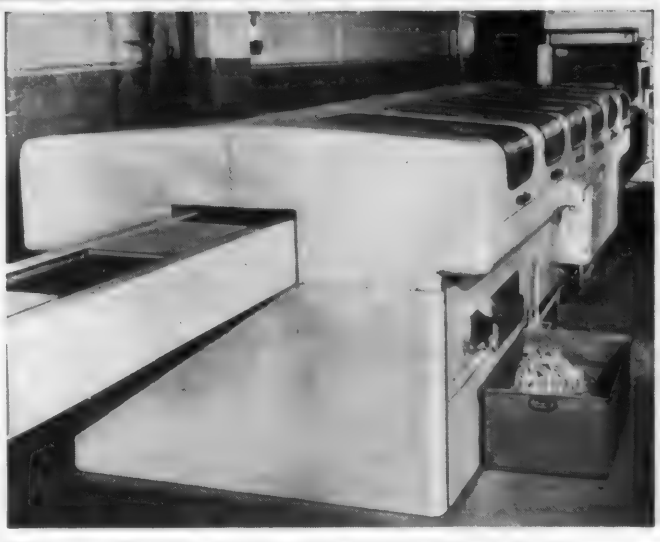
(and incorporate existing wafer ovens if necessary)



Two 24-plate ovens (right) feeding by conveyor to spreading and sandwiching machine (left).

This Baker Perkins Automatic Wafer Plant incorporates two 24-plate wafer baking machines—one of the best-known units in the biscuit industry. If you already have 24-plate ovens (of the latest type with automatic discharge), the new Baker Perkins wafer system can be added. Completely automatic, it includes a method of taking the wafers from the ovens, conveying, spreading, sandwiching, cooling, cutting, separating and batching. It could also include enrobing, chocolate cooling and wrapping.



Machine for cutting large wafer blocks into small biscuits. Because automatic layering gives perfect regularity of block, cutting is to fine limits and scrap is saved. Cutter also separates, batches and feeds automatically to enrober.

Photos by kind permission of Gray Dunn & Co Ltd, Glasgow, whose new automatic wafer plant extends from ovens right through to Flowpak wrapping

Please write for further details . . . . . . ***Baker Perkins Ltd***

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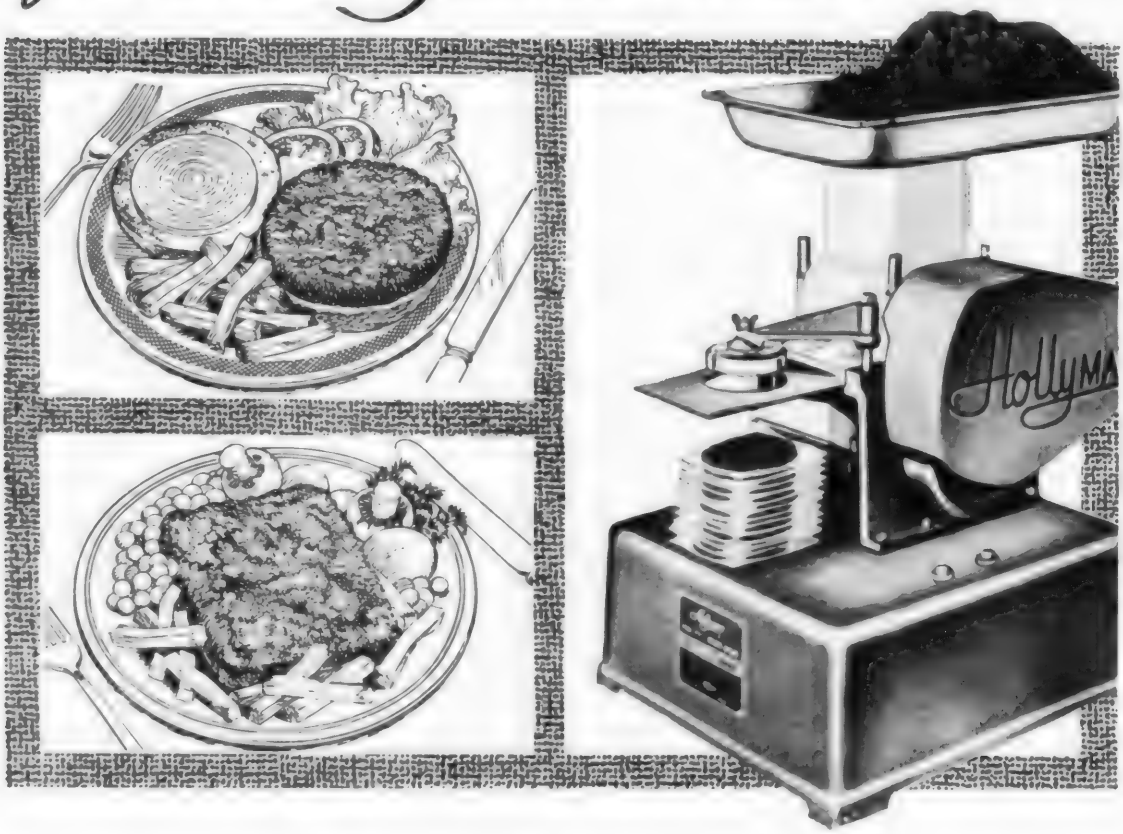

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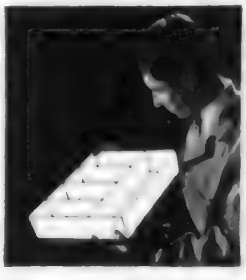

He agrees

As a boxmaker he knows what "THAMES BOARD" means to good packaging. The cartons and boxes which he makes may be taken for granted, but they are the economic, protective packaging essential to modern marketing.

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LEAD NOT MORE THAN 10 PPM
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The *Antioxidant in Food Regulations, 1958*, permit the use of butylated hydroxytoluene in a variety of foods: 'Topanol' BHT is prepared with great care specially for this purpose.

'Topanol' BHT conforms with the requirements of the *Food Hygiene Regulations, 1955*, and other relevant legislation under the *Food and Drugs Act, 1955*.

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Lead	—	*not more than* 10 p.p.m.
Arsenic	—	*not more than* 2 p.p.m.

Animal and vegetable oils and fats, and baked and fried foods containing these, are protected from rancidity at concentrations as low as 0.01% by weight—cooking temperatures do not destroy activity.

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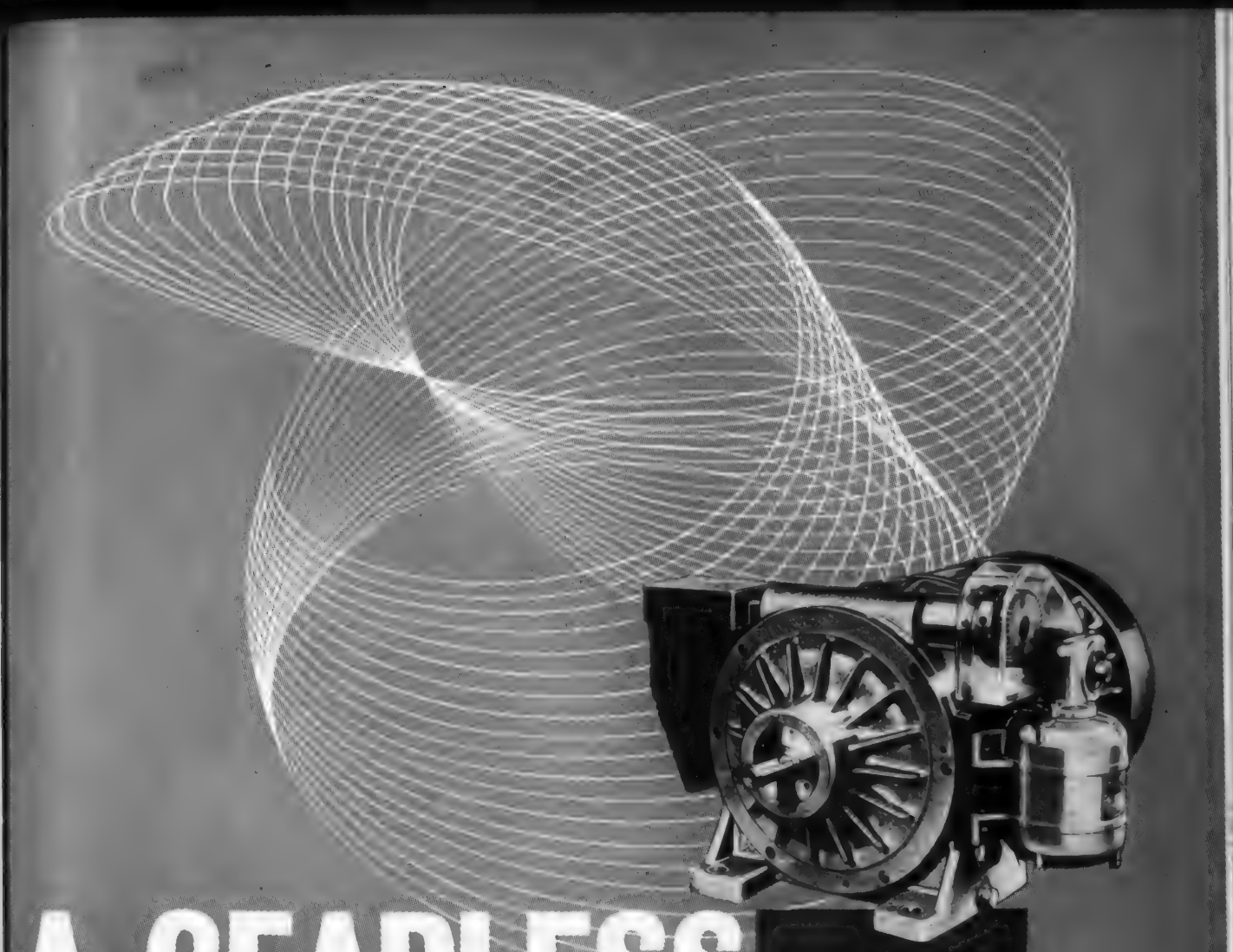

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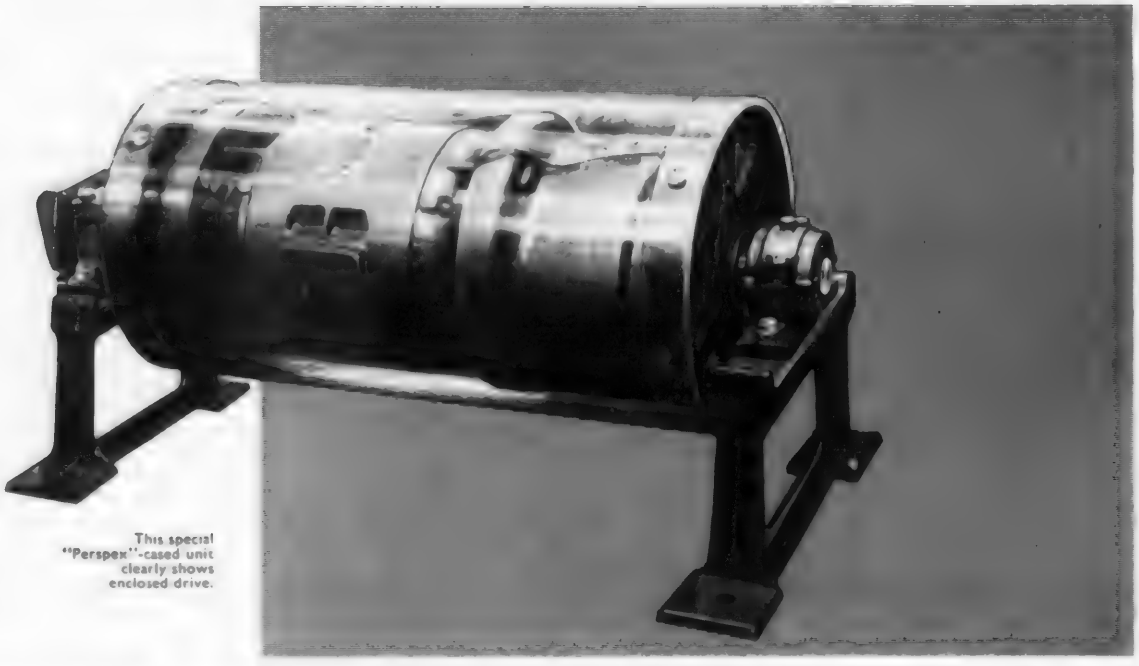

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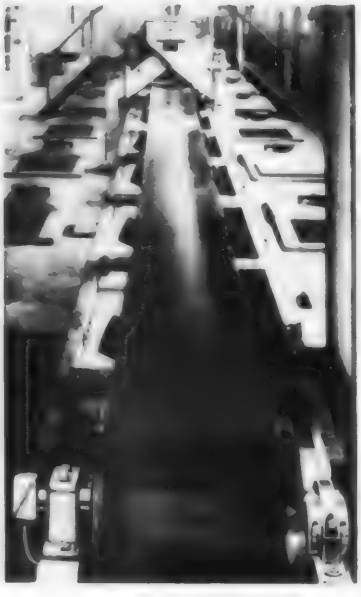

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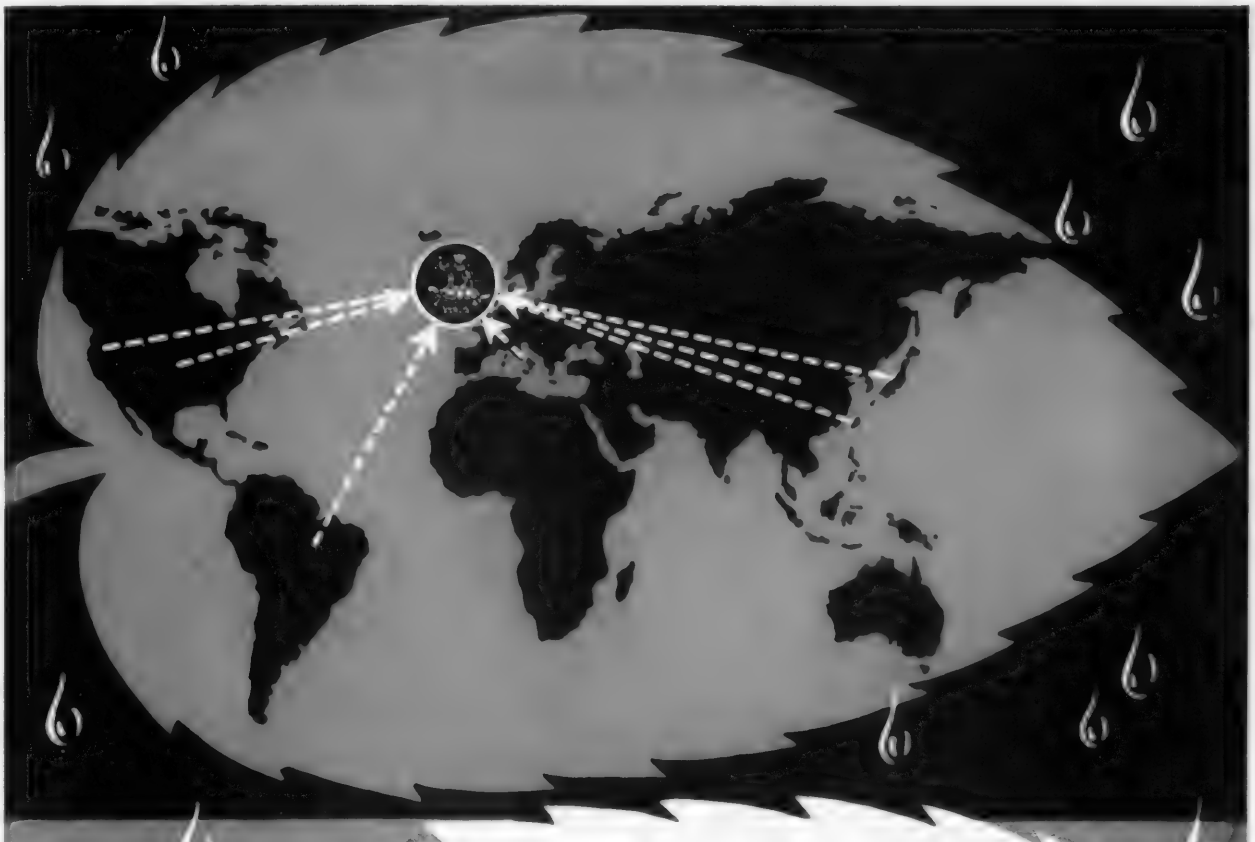

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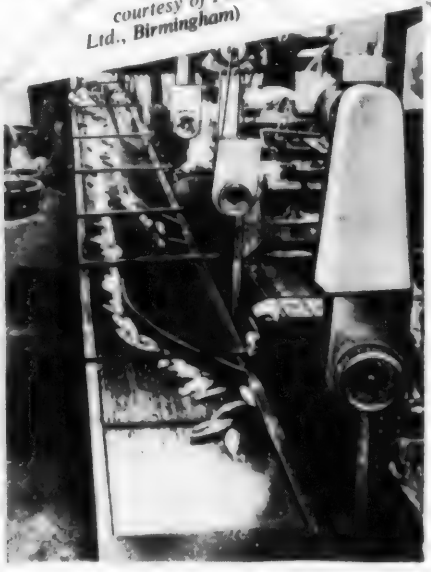
Fruit bottling on a 'Motaveyor' conveyor (by courtesy of J. Mawdsley Ltd., Wigan)



Scandura conveyor in a fish canning factory (by courtesy of Fisher & Ludlow Ltd., Birmingham)

As the pioneers of P.V.C. covered conveyor belting British Belting & Asbestos have supplied their SCANDURA belting for many varied applications. Due to its resistance to contamination and its hygienic qualities SCANDURA has become the obvious choice for food conveyor belting. Its lasting qualities had already been proved in food factories two years before its first introduction in Britain's coal mines in 1948, and its fire resistant properties have brought a hitherto unknown safety margin where conveyor fire hazards originally existed. SCANDURA is available now, in varying widths and thicknesses to suit all applications.

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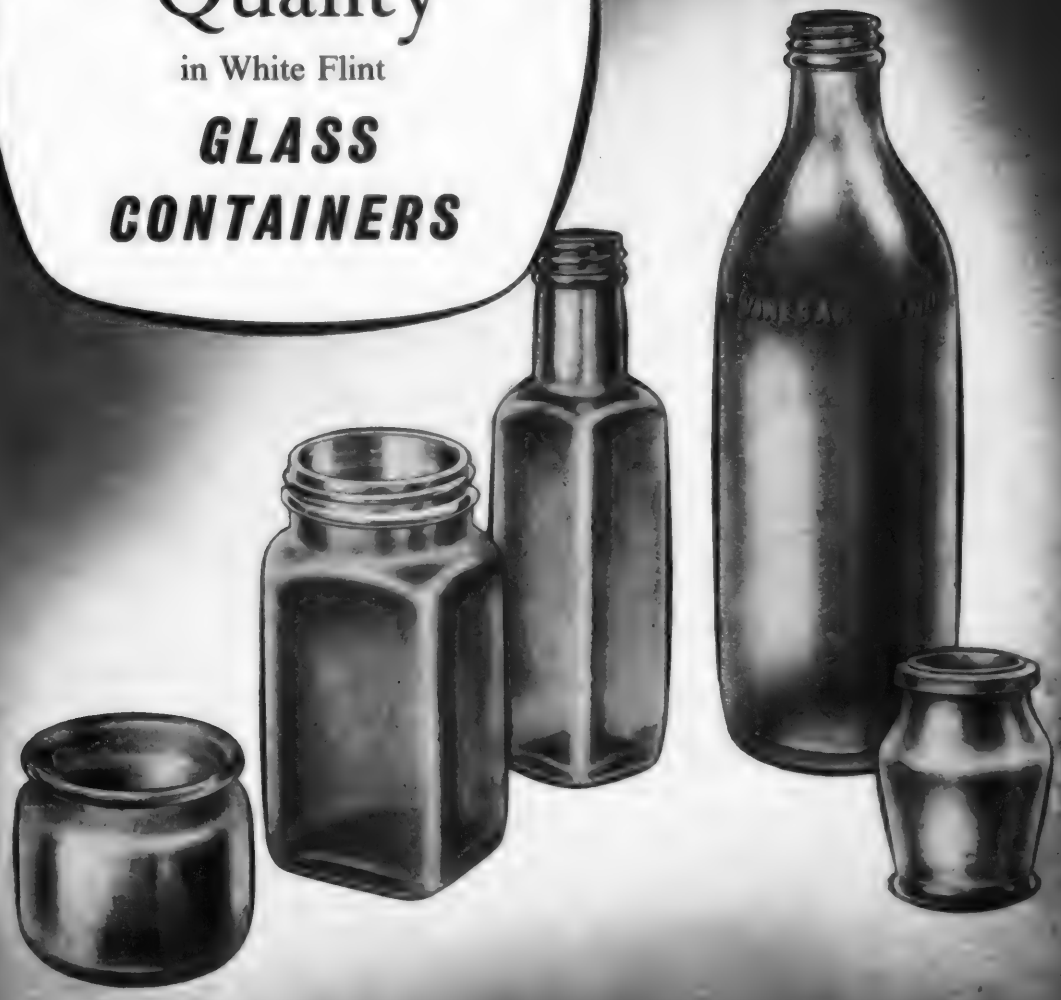

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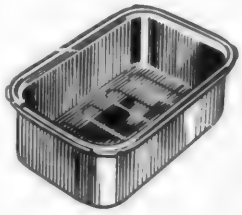

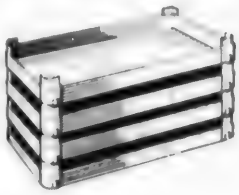

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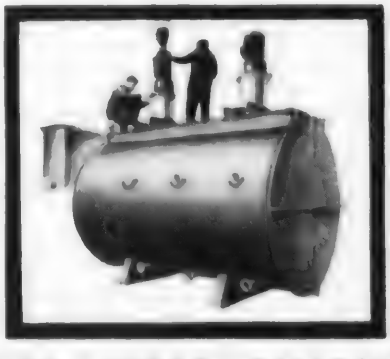

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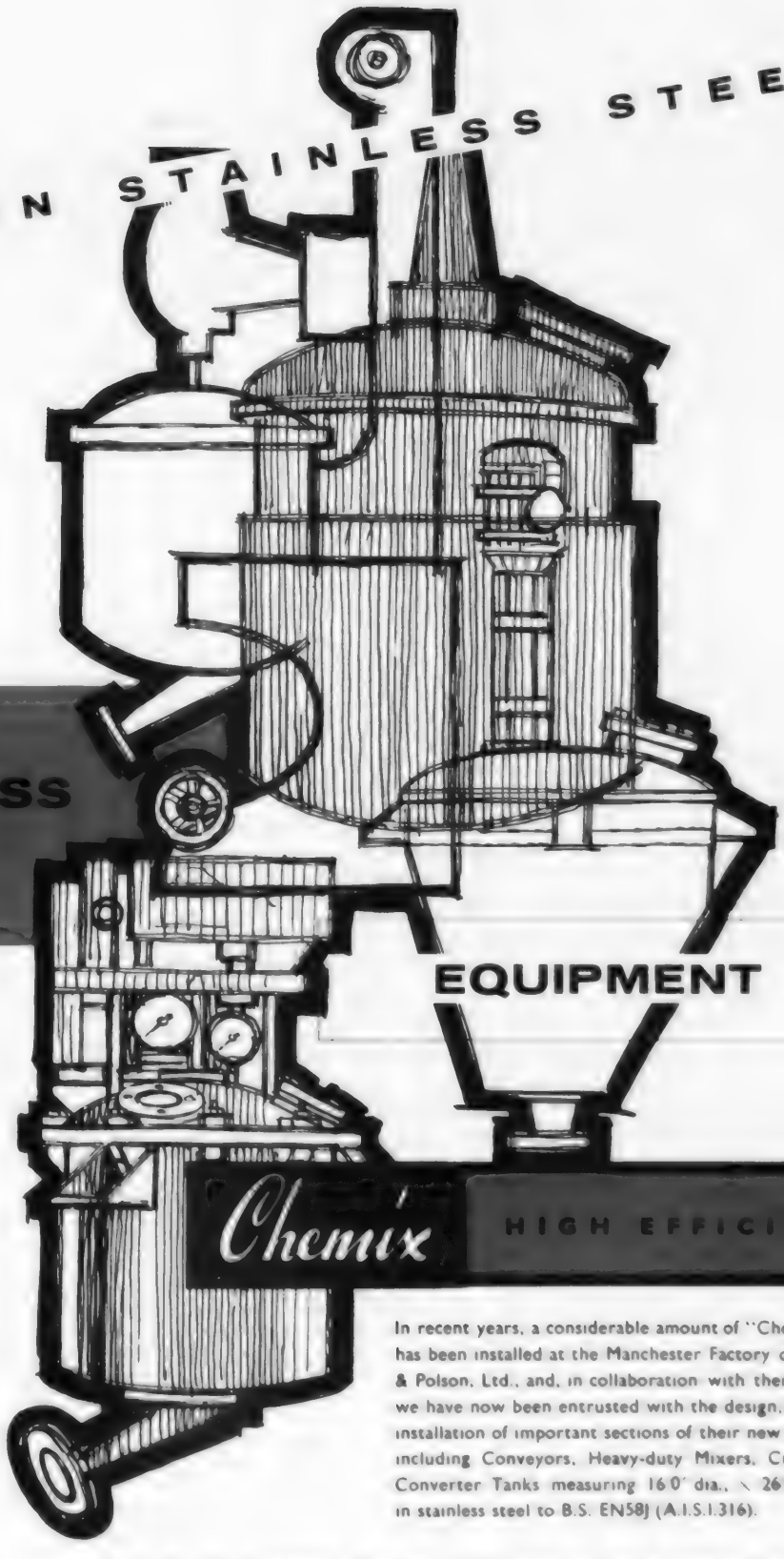

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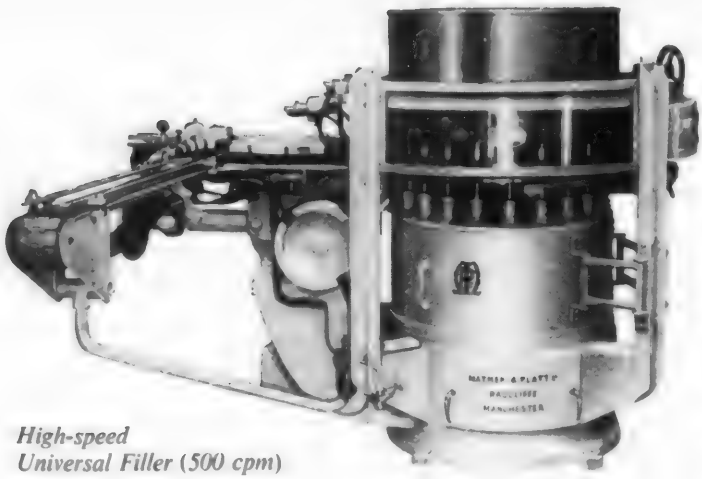

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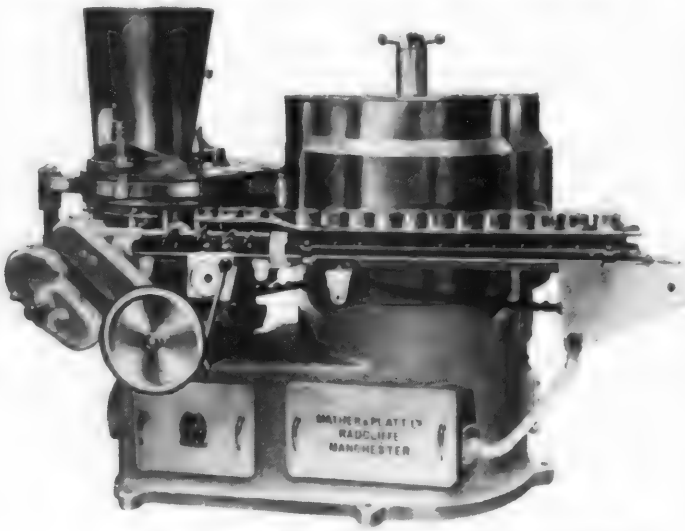
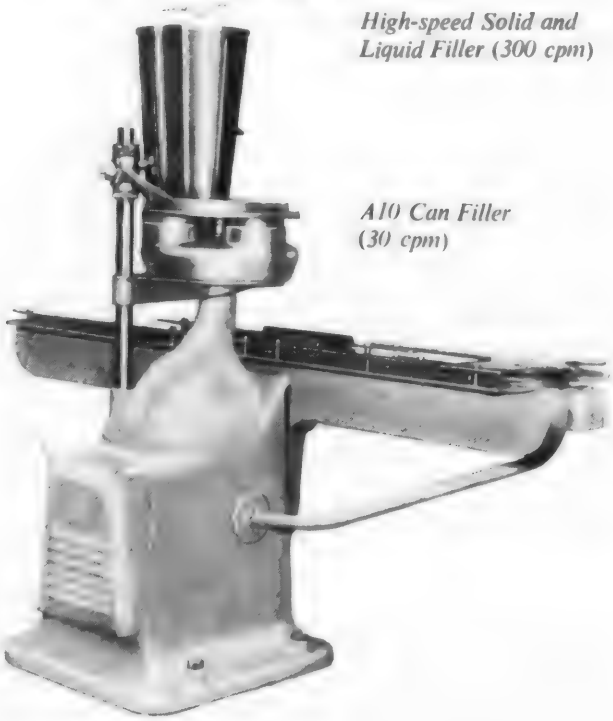


High-speed Solid and Liquid Filler (300 cpm)



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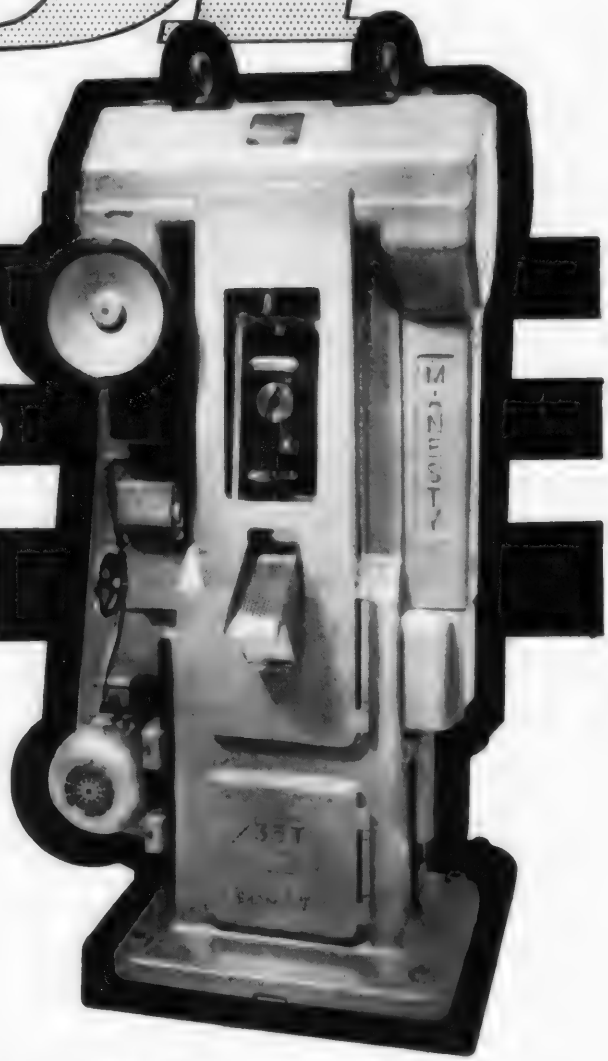

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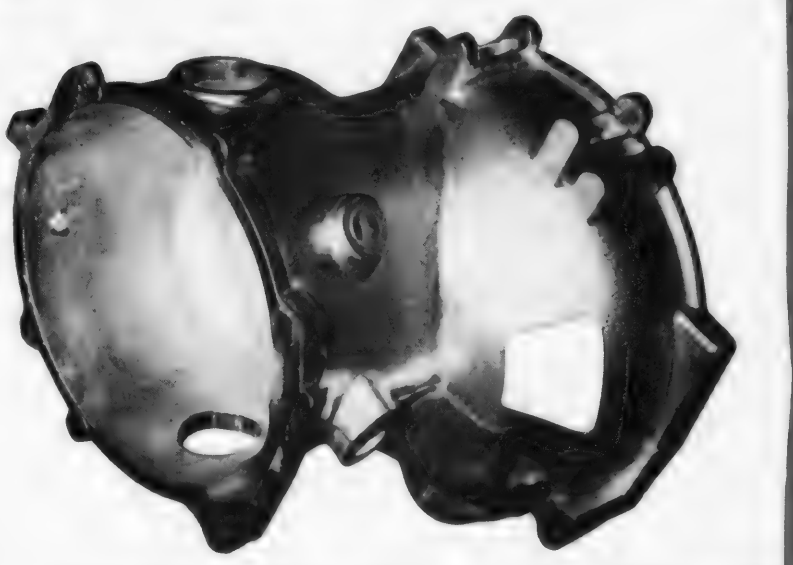

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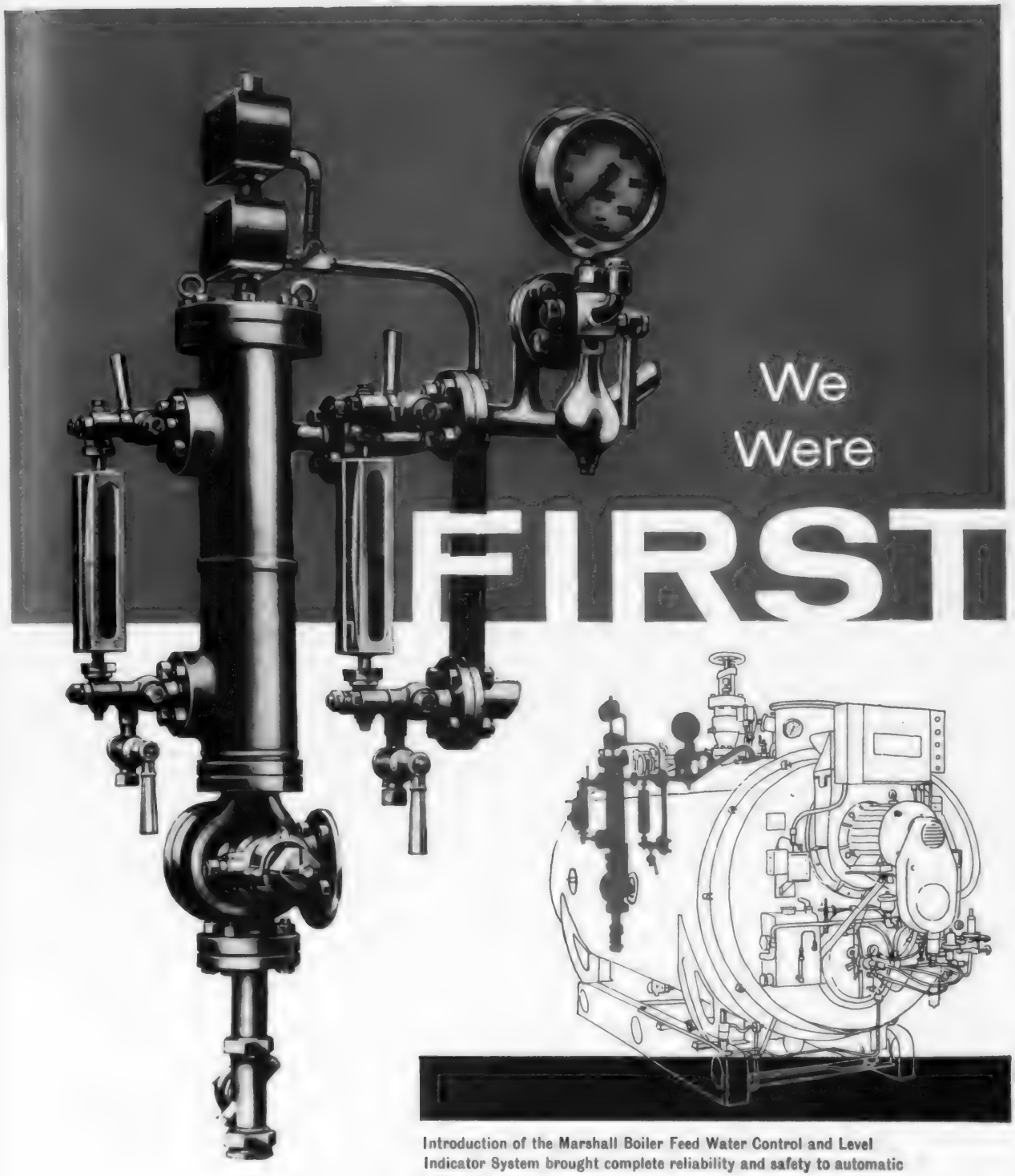

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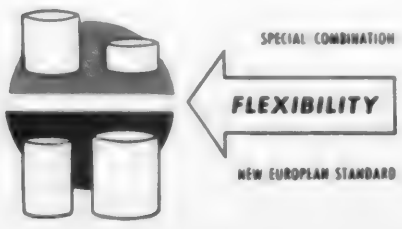

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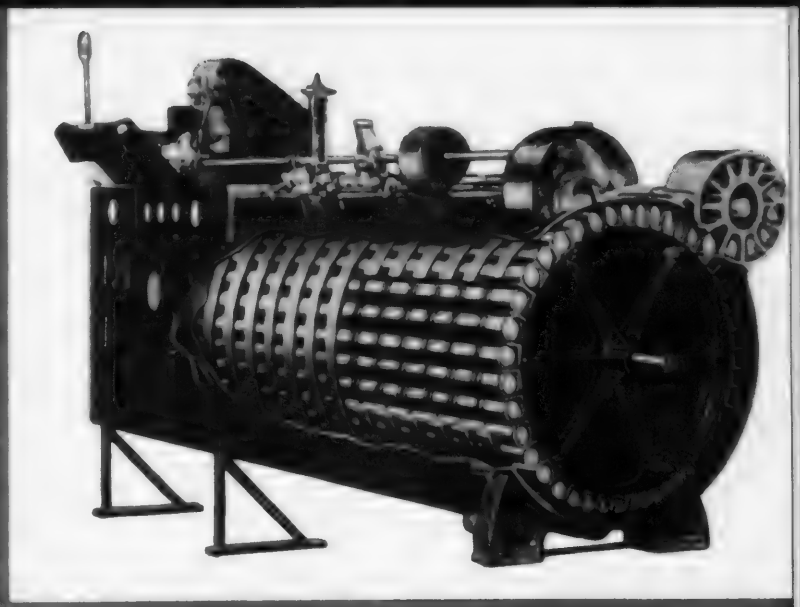

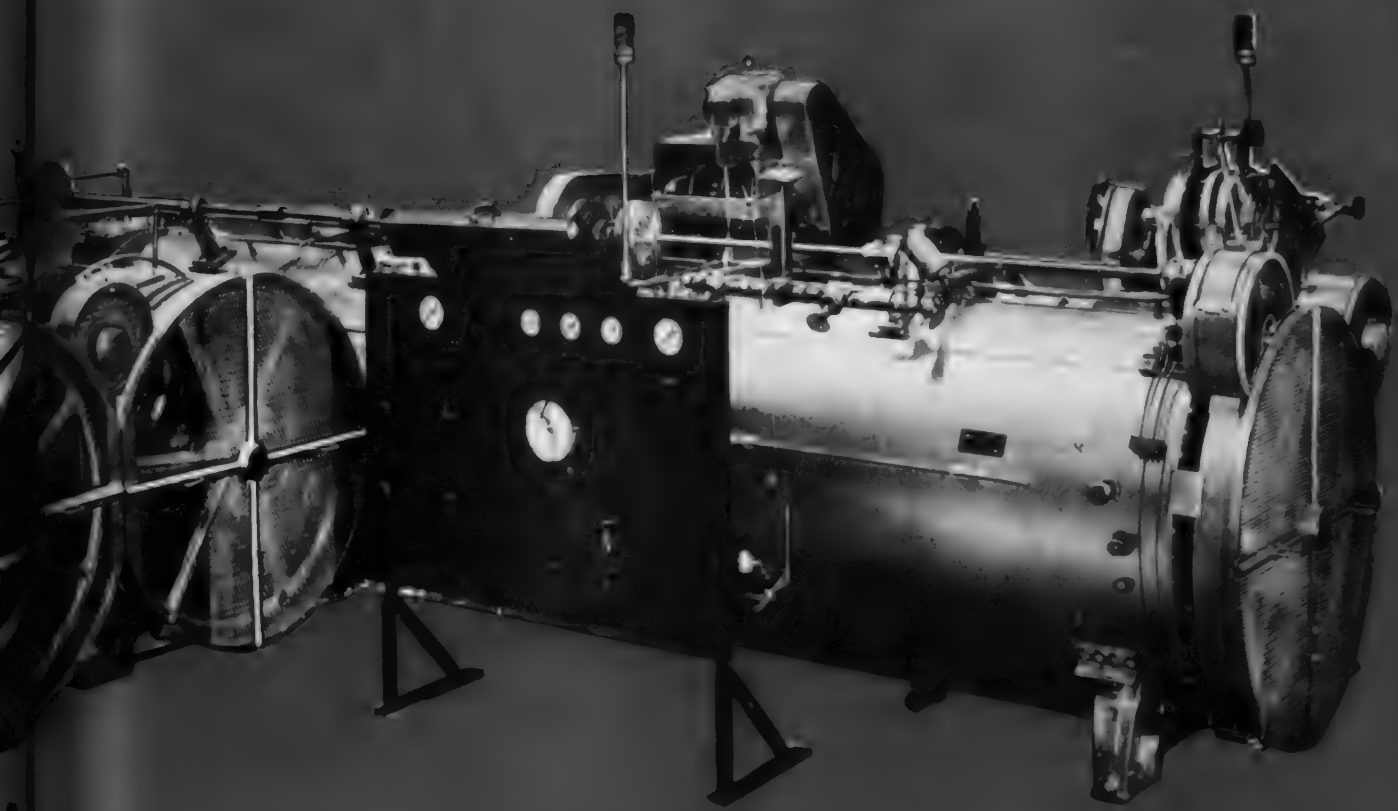

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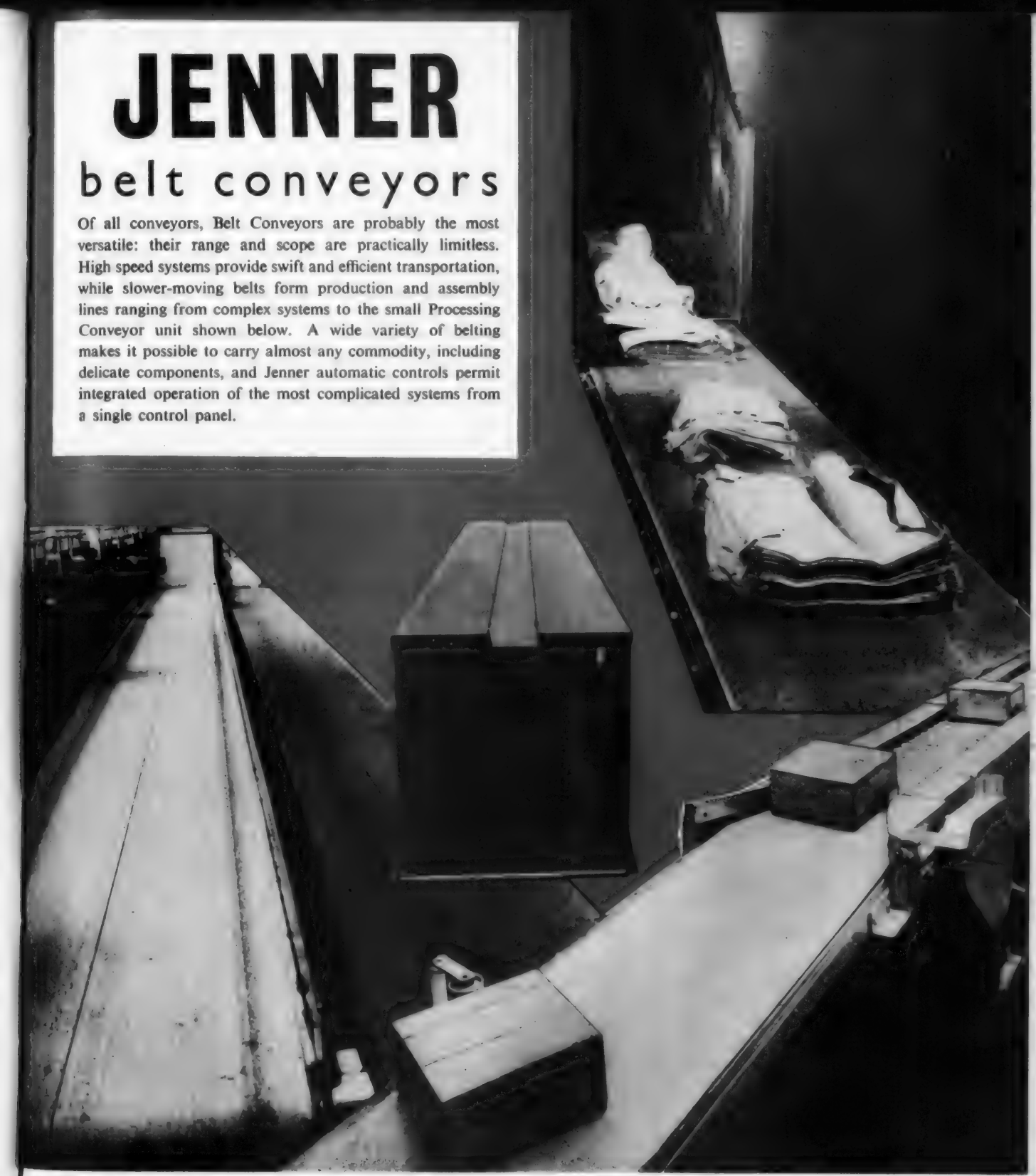

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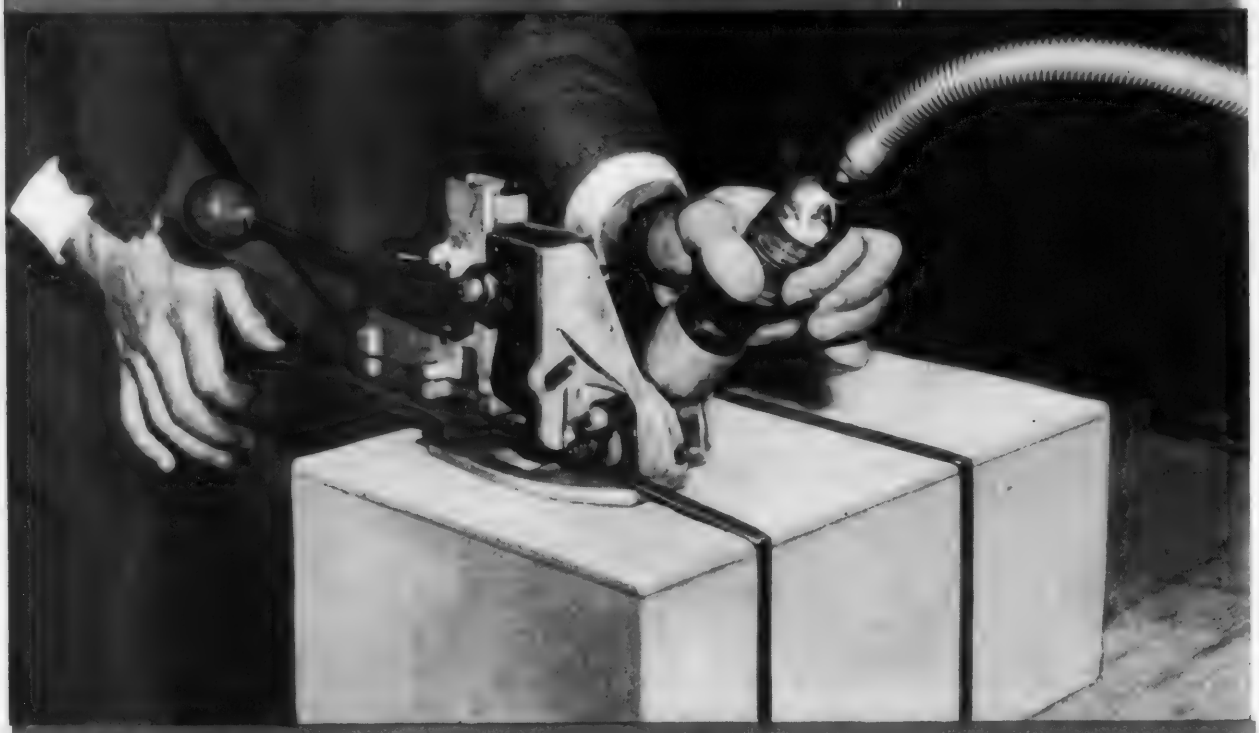

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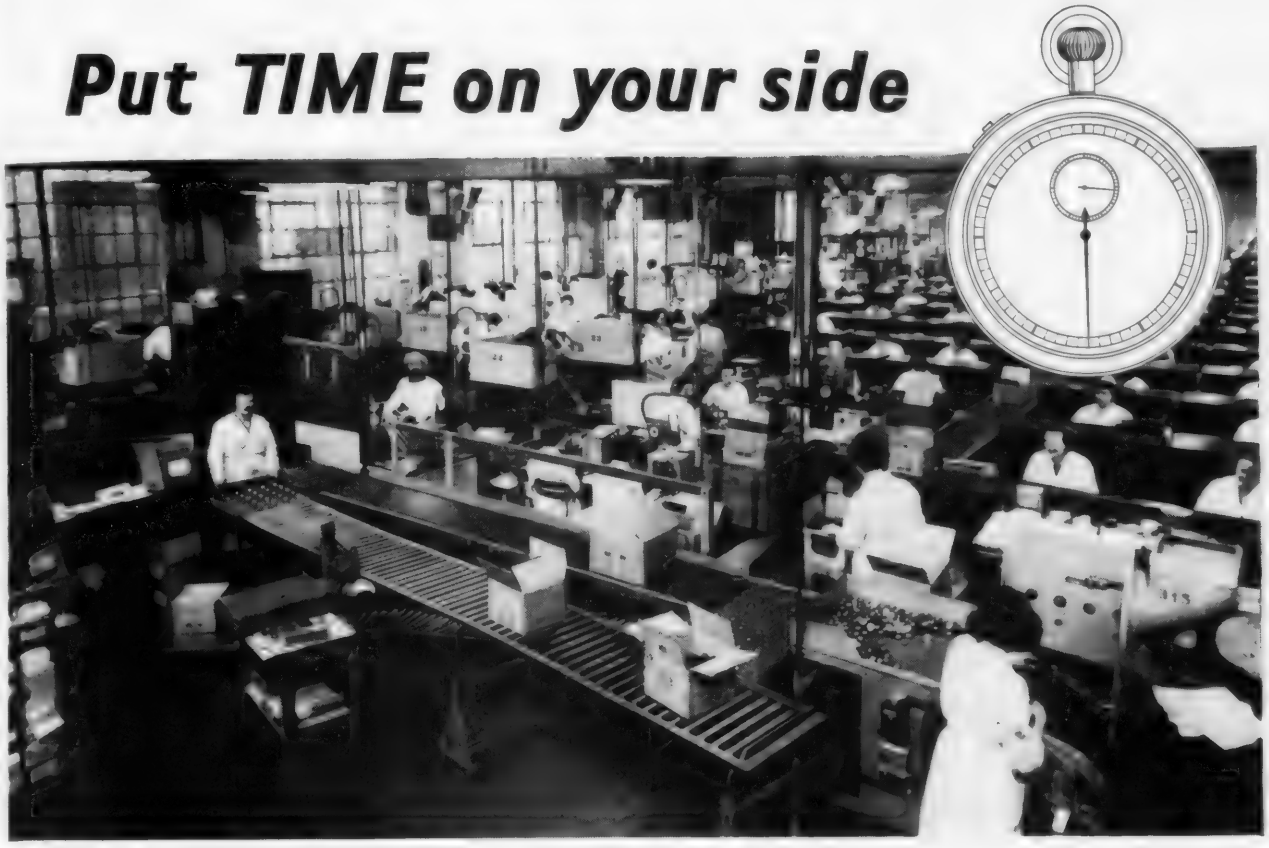

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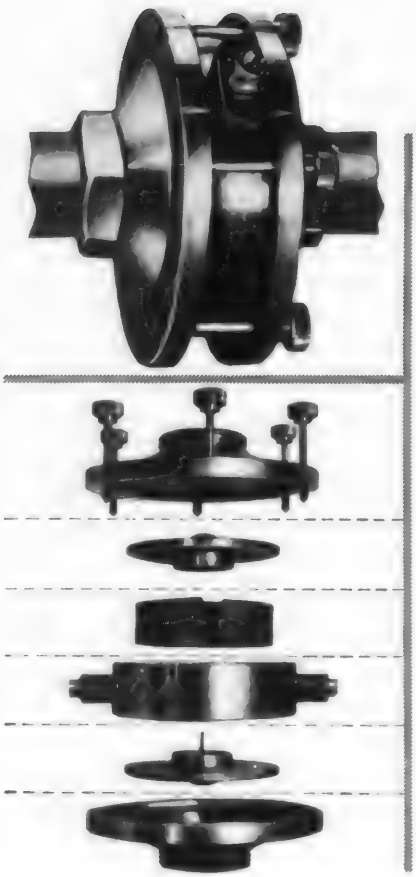

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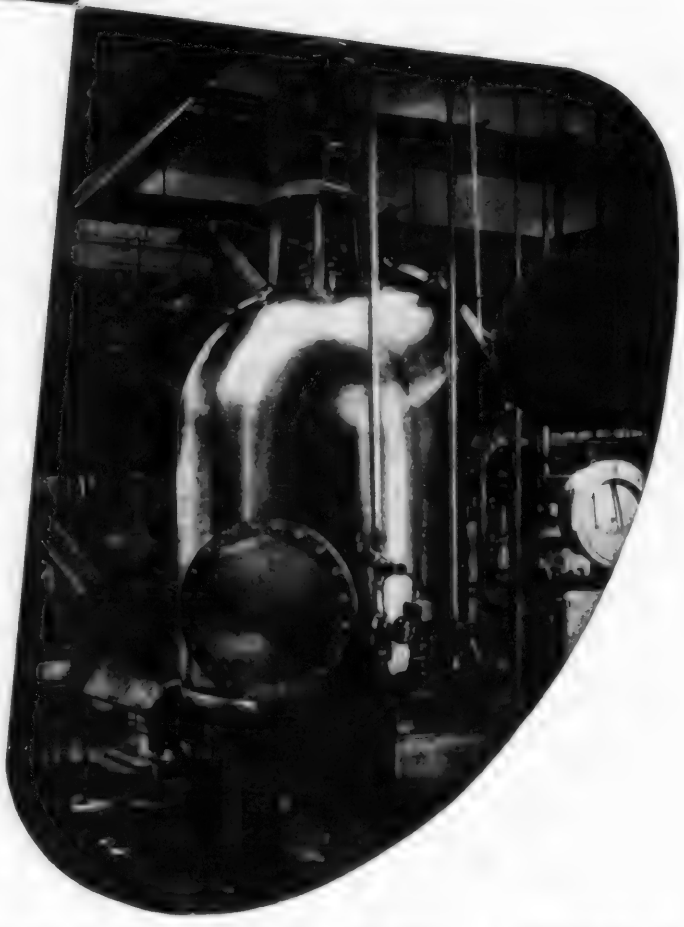

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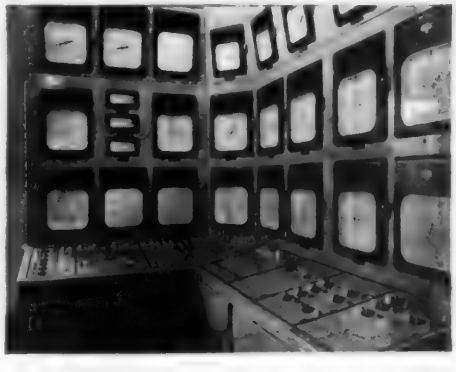

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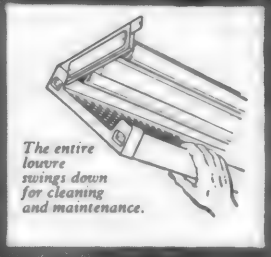

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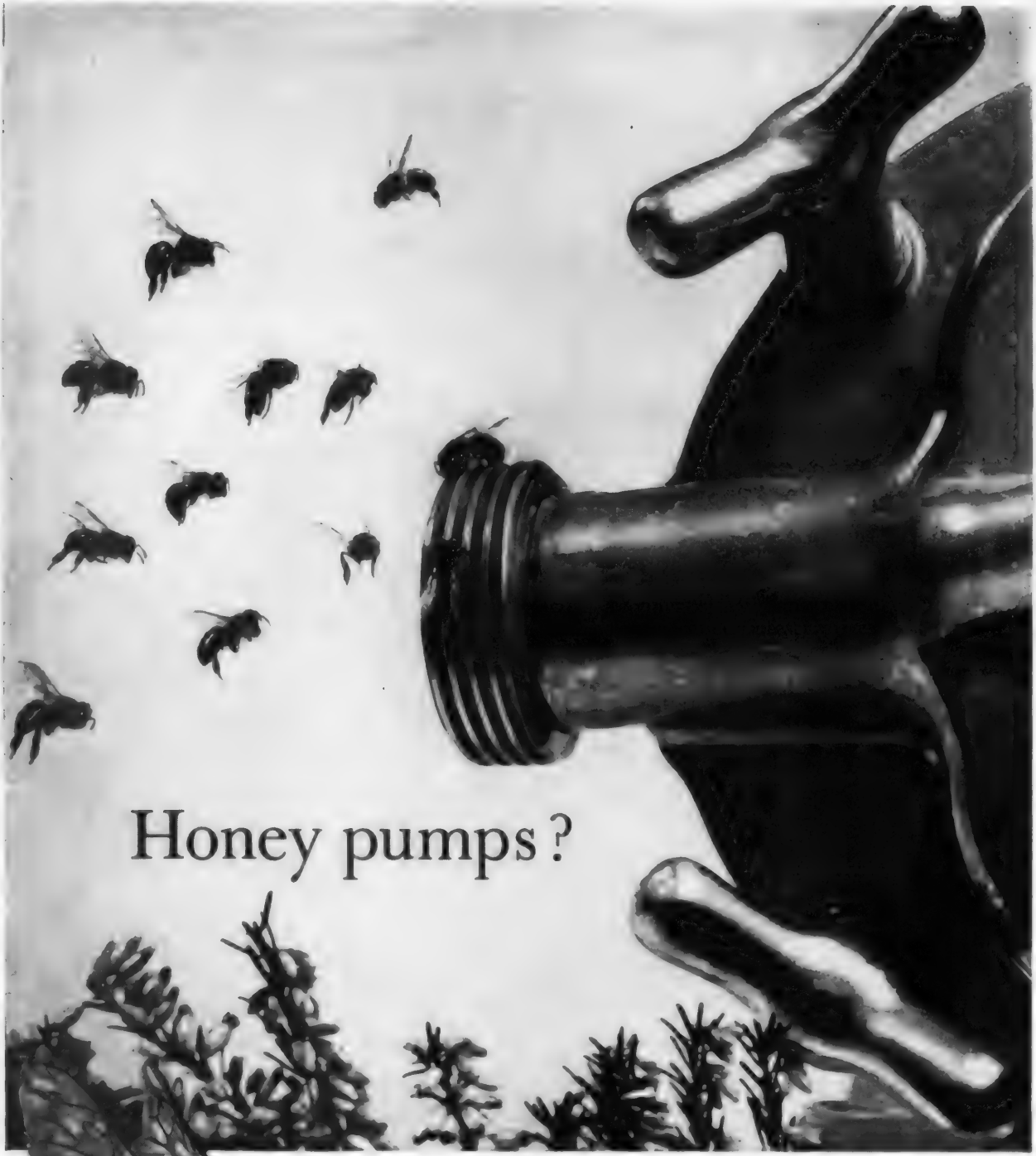

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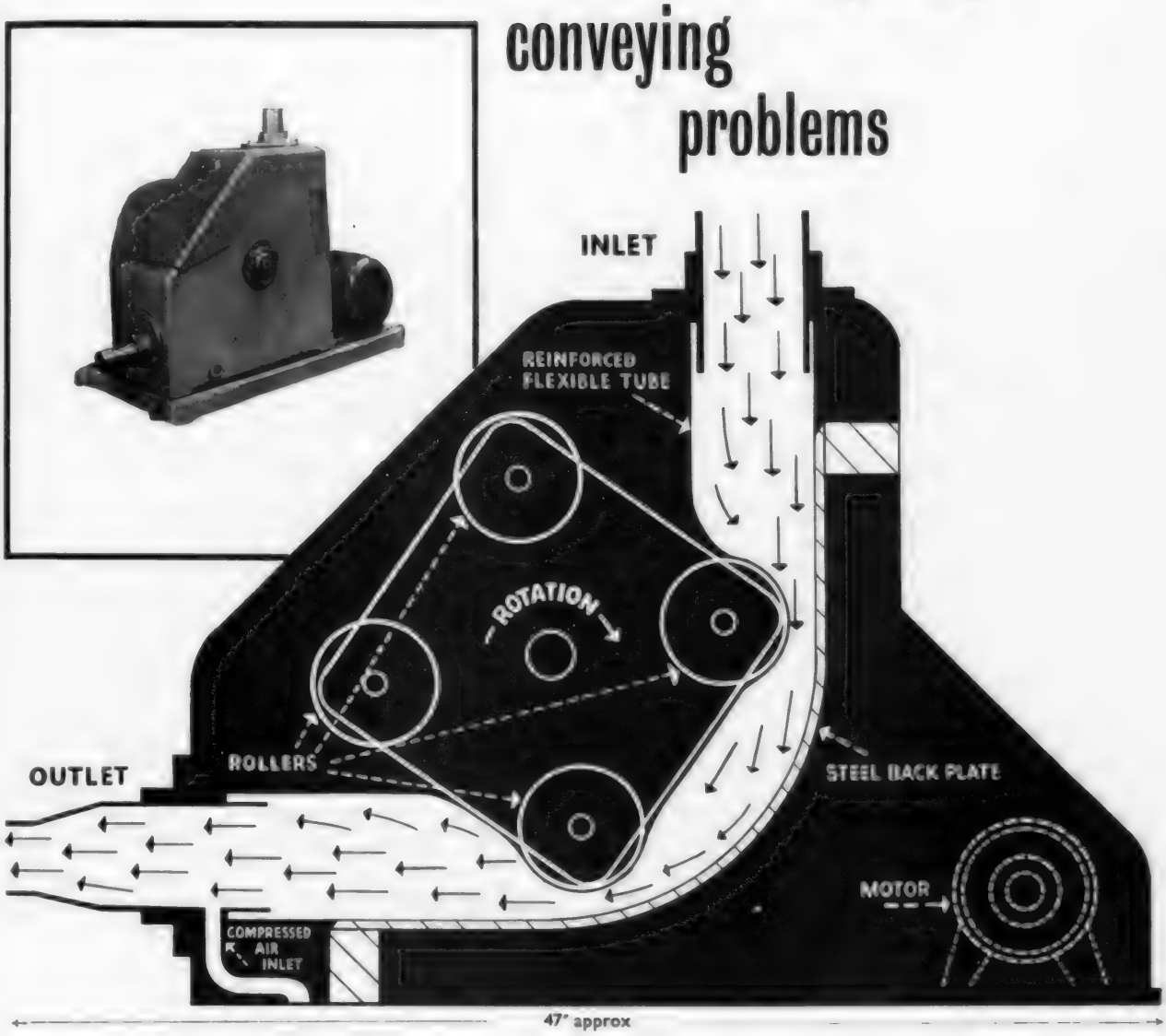

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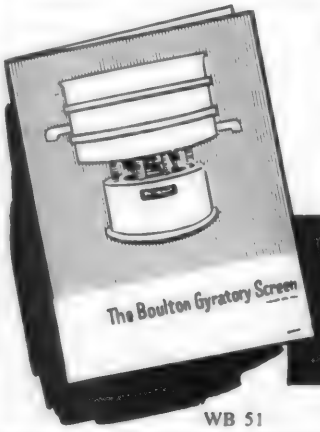

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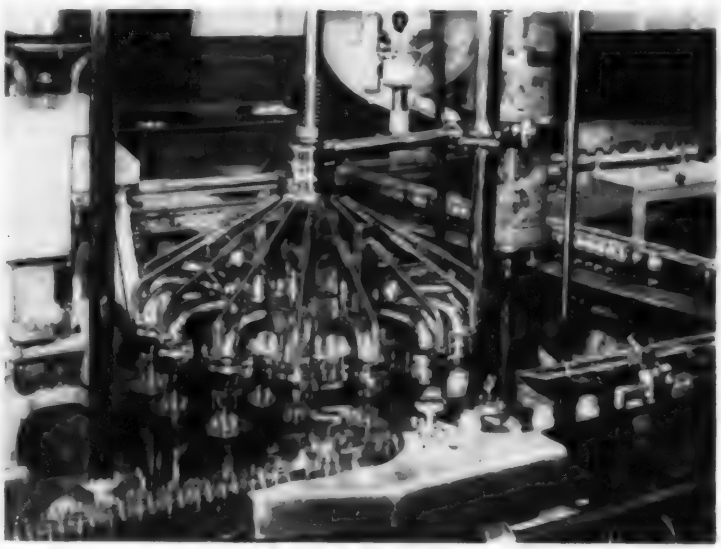

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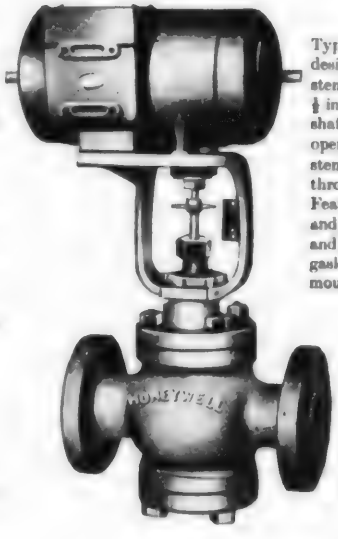

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FOOD MANUFACTURE

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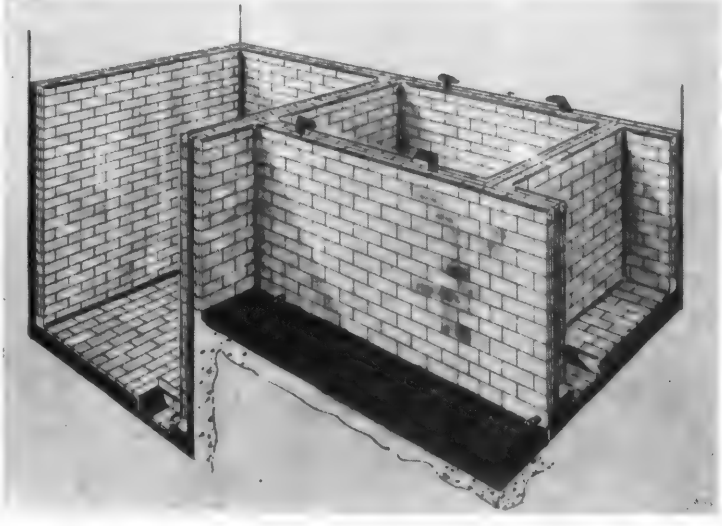

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FOOD MANUFACTURE

Vol. XXXV, No. 4 April 1, 1960

A biological testing station

PROPOSALS for establishing a biological testing station for food additives and adjuncts have now reached the stage of canvassing for funds from prospective members. Such a station is long overdue. The idea was mooted years ago, but for various reasons, suggestions that organisations within the food industry should establish such a testing centre fell by the wayside, and, as is often the case, the fact that the scheme is now in process of becoming a reality is due entirely to the determination of a few enthusiasts.

If the present proposals command sufficient support, there is no reason to suppose that the D.S.I.R. will not provide a grant on the same basis as those already given to the industrial research associations. In the sense, then, that discussions on this point are proceeding, it may be said that the proposed testing station has official approval. The B.F.M.I.R.A. at Leatherhead have already offered, at a reasonable rent, a site of the required area adjacent to their own laboratories, and without doubt such a location would be eminently suitable.

Strong objections have been expressed to the proposed title of the new establishment—"Food Testing Research Association." In the first place, this title does not adequately describe its true functions, which will primarily be to test additives and adjuncts, many of which, such as pesticides, agricultural sprays and fertilisers, do not come within the description of foodstuff at all. Secondly, "food testing" will have sinister connotations for sensation-mongering columnists in the more lurid sections of our press, who will no doubt manage to inspire misinformed comment on why such a "food testing" station should be necessary at all.

One very pertinent question to which no answer has yet been given is, who decides the grounds for saying that such-and-such an additive is harmful or otherwise? Who lays down the standards by which materials under test are to be judged? We need only point to the international confusion that exists over the question of permitted food colours, to mention only one example, to show that the answer to this question will not be straightforward. Why are some food colours on the permitted list of one country and prohibited in another? The answer must be that the same results are interpreted differently in different quarters, for the basic facts of research are, or should be, common to all. We hope that when the new station gets going, its results will shed clear light instead of making confusion worse confounded.

In-place cleaning

WHAT has in-place cleaning got to do with population problems? Quite a lot, according to a speaker at a recent S.C.I. Food Group meeting. If population increase continues at its present rate, by the year 2960 there will be one person for every square yard of the earth's surface (we do not accept any responsibility for the calculation involved). We think it reasonable to suppose that the supply of flesh and blood would have run out long before this state of affairs was reached, but looking forward no further than the end of this century, a doubling of present population has to be allowed for. As far as can be seen, world food resources will be sufficient to cope; the big problem will be distribution rather than production.

Most of the population increase will occur in what are termed the "underdeveloped" countries—India, China, Russia. The pace of industrialisation in these countries is at present frantic, and in the next 40 years a large number of new food factories are going to be built. Strange as it may seem, a major problem in many of these countries is labour shortage; with so many people engaged in producing food from the land, labour for the factories is not plentiful, and great emphasis is going to be placed on automation, particularly in countries like Russia.

In-place cleaning of plant, by which plant is first cleaned with detergent solutions and then sterilised with non-toxic bactericidal compounds, without dismantling of the plant in any way, will undoubtedly become of much greater importance as a means of cutting down labour, economising in cleaning materials, making sure the cleaning job is done thoroughly, and preventing the rapid wear of plant items which are continually being dismantled and put together again. The cycle of operations and the time at which they are carried out can be made entirely

automatic; indeed, this is one of the great advantages of the in-place cleaning system.

It is perhaps not surprising that in-place cleaning techniques have been largely pioneered by dairy technologists. Milk being what is it, its handling requires a more hygienic approach than most foods, although this is not to admit that the handling of any other kind of food should be any less hygienic. One of the fundamental requirements of in-place cleaning techniques is that the plant must be designed for them; provision must be made for adequate flushing of pipelines at a liquid velocity of not less than 5 ft./sec., and tanks and storage vessels must be so fitted that an internal spray of cleaning detergent will effectively shift and flush out any sediment. If there are stagnant pockets in pipelines, in-place cleaning will do more harm than good. Not only will such pockets allow bacteria and moulds to develop, but they will trap detergent which will subsequently find its way into the product—a most unwelcome prospect.

Detergents and sanitisers

IT is surprisingly easy to overlook the sanitary aspects of some familiar plant item whose unobtrusiveness may conceal the fact that hygienically it may be a menace. At the Food Group meeting referred to, an instance was quoted of a conveyor at a poultry processing factory which was used to transport carcasses suspended by the feet. The endless conveyor merely went round and round; at one point the carcasses were hooked on and at another they were unhooked. Nobody gave the conveyor much thought until it was discovered that severe contamination was being caused through neglect to clean the conveyor.

Another instance was a fruit juice processing plant in Spain which was being plagued by bacterial contamination from an obscure source. The source of the trouble was eventually traced to a large holding tank; when the downstream section of the processing line was interrupted for any reason, the tank filled up, and as operations were resumed, the level of liquid fell. Fermentation then started on the wetted sides of the tank, which, of course, caused contamination. The trouble was cured by replacing the holding tank by three others of much smaller capacity, using each in rotation, and instituting a regular cleaning routine.

In-place cleaning requires a suitable detergent and sanitising agent. Of the latter there are four groups: the old faithful, chlorine and its variants, such as sodium hypochlorite and the newer organic chlorine compounds, for example, dichlorodimethylhydantoin, which are more stable; the quaternary ammonium salts; amphoteric agents such as substituted amino acids; and a group of substances known as iodophors, which consist of iodine dissolved in a solubilising agent. The literature concerning the last-named is very sparse, and it seems that early claims regarding their superior virtues were a little exaggerated.

This month we are devoting some space to the important question of hygiene in the food factory, and review some of the detergents, cleaning agents and aids to cleanliness which are available to the manufacturer. It must never be forgotten that with all the modern adjuncts to better processing, the foundation of factory hygiene is good housekeeping, which comes from an attitude of mind fostered by good management.

Horrible murder

NOT content with foisting the ugly word "broiler" on to the English language, the chicken people have excelled themselves with a fresh atrocity—"agribusiness"—coined, in a press release from the Chicken Information Council, to describe what is claimed to be a new technique of farming. We know nothing about this new technique; it may be the last word in farming, but that is beside the point. "Agribusiness" must certainly be the last word; let it be strangled at birth and cast away hurriedly as an unwanted thing before it has time to stick.

The English language has the richest and most descriptive vocabulary of any language on earth. Why then is it made to spawn these monsters, which confuse instead of describe, and make a travesty of that noble accomplishment which distinguishes man from the beasts, Speech? We do not claim that FOOD MANUFACTURE'S prose is exemplary; only too conscious are we of its frequent failings. But we do try to avoid the more glaring examples of what the well-known musical show *My Fair Lady* aptly calls "the cold-blooded murder of the English tongue," a crime which regrettably is perpetrated very often by technical journals.

Horsemeat

THE furore about the live horse trade between the Irish Republic and the Continent has focussed attention on a once thriving business which is now but the shadow of what it used to be. The reason for this decline is not far to seek—farm mechanisation has drastically reduced the horse population, at least as far as this country is concerned.

Some figures in a recent issue of the *Financial Times* show just how much the horsemeat business has declined in this country. A fair amount is, and always has been, sold for feeding to domestic pets, but the amount traded for human consumption even now is much larger than one might expect. About 8,000 tons a year of frozen meat is imported, all cer-

tified fit for human use; most of this is from the Argentine, but some comes from Central and Eastern Europe. A good deal of this, however, goes for pet food, although some is eaten by humans—do all of them know, we wonder? It is nice to know that our pets get meat which is good enough for their masters.

It is well known that horsemeat is far more widely eaten on the Continent that it is here. Export of live horses from this country for slaughter is prohibited, and the amount of frozen horsemeat sent abroad is negligible, all of it being wanted by the home trade. The number of horses slaughtered for human consumption in 1958 in this country was only a quarter of the 1952 total, and although there are officially 63 licenced slaughterhouses in England and Wales, only 23 of these are in operation at the present time. One slaughterhouse at West Ham which dealt with over 14,000 horses in 1952, handled only 745 in 1958. All these horses were for human consumption.

Knackers' yards, of which at present there are about 330 licenced to kill for animal food only, now handle mostly cattle, and one of the biggest yards in the country now kills on an average only 10 horses a week. According to size and condition, a horse fetches between £20 and £40. From an average total weight of about 1,200 lb., 900 lb. can be sold as meat for about £45; the hide, weighing about 40 lb., fetches about 9d. a lb.; the bones are sold for fertilisers and the fat becomes tallow. All told, the knacker makes a profit of about 20%. Which is, when all is said and done, a cold and dismal way of reckoning the value of what once was man's best friend.

The case of the exploding marshmallows

CHOCOLATE-COATED marshmallow biscuits which burst at the seams in the galleys of high-flying airliners are the latest problem confronting biscuit manufacturers, we learn from a press report. The number of variable factors which have to be taken into consideration under modern conditions of handling and storage are enough to turn the food technologist's hair grey. Who would have thought that the pressure inside a Viscount flying at 18,000 ft., 0·864 times that at sea level, would be low enough actually to burst some food items? But it is true, and space-age problems are upon us with terrifying reality.

In this case the problem was solved by making the base of the marshmallows porous to allow equalisation of pressure within and without. But severer problems are no doubt on the way. When passenger carrying rockets have become a reality, the problem of acceleration must be taken into account. Will your products stand up to an acceleration of 10G? Perhaps what is more to the point, will the passenger?

Radiation sterilisation: the end?

WE always had the feeling that irradiation of food was like backing the wrong horse; there was no future in it. The cancellation of the U.S. Army's research project in this field, referred to by a contributor on another page, is hardly surprising. The problem of flavour deterioration has so far proved insurmountable.

Other things being equal, it is very difficult to see how radiation sterilisation could ever compete economically with heat sterilisation, particularly as the latter has the additional virtue of cooking the food, which in most cases has to be done anyway. We feel, too, that irradiated foods would meet with considerable sales resistance among common folk who associate radioactivity, not without reason, with things more lethal than food.

Dehydrated foods

IF the 'fifties were notable for the boom in sales of frozen foods, some people are predicting that the 'sixties will be an era of dehydration. Prophecy is a chancy business at the best of times, and we are certainly not going to try and compete with *Old Moore's Almanack*. Much research is going on at the present time into dehydration techniques, some of which have captured the attention of the popular press.

Dehydrated foods labour under a psychological disadvantage; the term conjures up in the minds of those old enough to remember, the grim dried foods of the last war. Servicemen in particular came to loathe the various dried vegetables and fruit which it was their lot to live on for long periods. But their modern counterparts bear little relation to these unappetising foods. Most people do not realise that a certain form of dehydrated product—packet soup—has been established on the market for some time. Dried coffee, and, more recently, dried tea, have overcome the initial scorn of the sceptics.

But dried foods have yet to make the spectacular impact on the market that frozen foods have done, and before they do so, if they ever do, certain fundamental problems have to be overcome. One of these is flavour deterioration, and another is that conventional hot-air drying can only be applied to a limited number of foods. Not subject to the latter restriction is the accelerated freeze drying technique developed by the Ministry of Food's Experimental Station at Aberdeen, in which food is first frozen and then dried in a manner analogous to the drying of the housewife's washing on a frosty day. It is claimed that this technique results in very little flavour loss in many cases, although until we ourselves have sampled food dried by this method, we refrain from comment on this point.

Not surprisingly, although British research workers have led the way in evolving techniques, it looks as though American interests will be the first to exploit them commercially.

A dehydrated food programme sponsored by a number of large companies has been launched to investigate product, processing and market research on a scale larger than could be undertaken by any one company alone.

It would not be surprising if the initial market impact of dehydrated foods came by way of the catering trade.

Pet foods

THE growth of the pet food market since the war has, like many another business, been spectacular. At the present time it is estimated that there are in this country 4 million dogs, 6 million cats and 7 million birds, a vast domestic animal population; a sizeable industry has been built up to cater for its needs. Take-over bids have affected this industry as in the case of others, showing that there is money to be made in the business of feeding Fido and Tiddles, characters which have appeared before in these pages (see May, 1959, p. 186).

It is estimated that about £40 million per annum is spent feeding Fido and Tiddles (not forgetting Tweetie) and their numerous relations. About £9 million or so, it is conservatively estimated, is spent directly on branded pet foods (£5 million for dogs, £3 million for cats, and £1 million for birds). While the U.K. population of dogs and cats has remained fairly constant over the last ten years, the cage bird population has increased about 12 times. Recent price reductions by all the well-known brands and the intensification of TV advertising show that competition in this field is becoming fiercer, new products are appearing, and at least one small producer is launching forth into the national field.

Curiosity prompted us recently to investigate, in collaboration with a learned colleague, the composition of three well-known brands of cat-food; elementary organoleptic and microscopic examination indicated that there were considerable differences in formula between the three.

This was confirmed by an investigation into consumer preference; samples of each were simultaneously unveiled before the startled gaze of the learned colleague's cat.

When the animal had recovered from its surprise at being confronted with such an unusual variety of food, it did not take long to sort out which it preferred; ignoring the others it gobbled up one of the samples with relish, showing that cats have their preferences as well as humans. We trust that the manufacturers are duly taking note of this.

What is luncheon meat?

AND how much meat should it contain? These questions are posed by Mr. J. D. M. Jones, Cardiganshire county chief inspector of weights and measures, in a quarterly report to the council.

Before mid-1959, he says, the composition of luncheon meat remained a matter of conjecture as far as the consumer was concerned. Random enquiries indicated that whereas to the less discerning the term had no significant meaning, to many others it implied an article of food having a meat content approaching 100%.

Unlike an ever-growing number of foods, the composition of luncheon meat has never been statutorily defined. That such a definition was needed is evidenced by the fact that last July, U.K. manufacturers negotiated, of their own free will, with the Association of Public Analysts a Code of Practice—a "gentlemen's agreement"—under which it was agreed that luncheon meat should contain not less than 80% meat. This became effective on October 1.

Throughout the quarter reviewed by Mr. Jones, the Code of Practice was therefore operative. In reporting on seven samples of this food which were deficient in meat content, the public analyst therefore based his findings on the minimum meat content agreed in the Code.

Six of the seven reported deficiencies concerned imported products. When the importers were approached, they pointed out that no legal minimum meat content was in force in this country, and that furthermore they were not a party to the negotiated Code.

They claimed that as 95% of the luncheon meat sold in this country is imported, many months would elapse before non-complying stocks could be worked off.

This shows the limitations of agreed codes of practice. The only encouraging information was that one firm of importers from Holland had prevailed upon its manufacturers to produce a luncheon meat complying with the agreed Code from October 1. It therefore follows that for some time to come, two kinds of luncheon meat, one "standard" and one "sub-standard," will be on sale in shops throughout the country and the consumer will not be able to discriminate between them.

Mr. Jones has suggested that the difference be indicated by distinguishing marks such as gummed labels; whether this suggestion is adopted remains to be seen.

It is clear that this confusing situation would not have arisen if the agreed standard had been the result of a legal instrument and not a code of practice.

How Brown and Polson make Starch Products

Trafford Park factory is Europe's largest wet-milling and glucose refining plant

Costing over £3 million, the recent extensions to Brown and Polson's Manchester factory enable complete shiploads of maize to be processed continuously. From the maize is produced high-purity starch which is turned into cornflour, glucose, dextrose, solid sugars and dextrines, and a variety of treated starches for special purposes; corn oil and animal feeds are valuable by-products. How all these products are made is described in this exclusive article, which is based on a recent visit we paid to the factory.

WHEN Brown and Polson, Ltd., was founded in 1840 by John Brown and William Polson at Paisley, Scotland, it did not use maize as raw material nor were its products intended for human consumption. At that time, laundry starch was made from wheat and starch used as a finisher for muslin was made from sago; it was as a supplier to the muslin trade that Brown and Polson originally traded. While searching for new raw materials, John Polson perfected his wet-milling process for maize in 1853 and patented the use of corn-starch as a human food; three years later, the first packets of Brown and Polson's Patent Cornflour were in the shops.

In 1923, the firm acquired the businesses of William MacKean, Ltd., and William Wotherspoon, Ltd., both of Paisley, the only other manufacturers of dry starch from maize in Britain. In 1936, they amalgamated with the Corn Products Refining Co. of U.S.A., who already had a glucose refinery at Manchester, and took over the Manchester plant. Today, their plants comprise one at Paisley and the one at Trafford Park, all of which have recently been expanded, besides a number of smaller units.

All the firm's packet goods, including their famous Cornflour, are produced at the Paisley factory.

(*Above*): **An ocean-going vessel tied up and unloading at the Brown and Polson wharf on the Manchester Ship Canal. In the distance are the 120 ft. high silos.**

What starch is

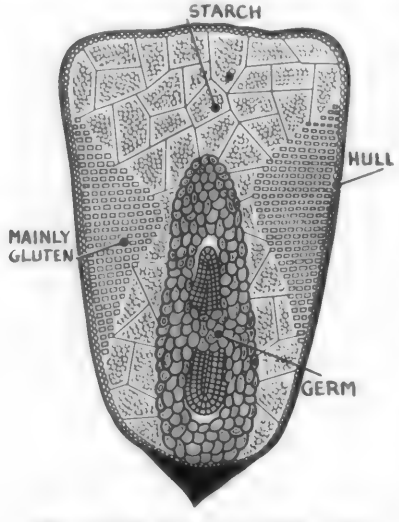
Starch is one of the most abundant carbohydrates found in the higher plants, frequently in the seed, as in corn or wheat, or in

various roots and tubers (tapioca and potato), or sometimes in the stem piths (sago). Its natural function is to provide a reserve food supply for the plant, sustaining it through winter dormancy and nurturing the new plant during germination.

It is synthesised within the plant by combination or polymerisation of dextrose, to which it is broken down by treatment with acid or certain enzymes. Similarly, dextrose is regenerated and utilised when the plant draws upon its reserve starch supply, or when starch is used as a food.

The naked eye cannot easily detect differences between refined starches in dry form from different sources, yet the microscope reveals that starch is composed of tiny granules whose size and shape is characteristic of each botanical variety. Thus potato and sago starches have relatively large oval granules, while maize starch granules are somewhat smaller and frequently polygonal in shape. Rice starch granules are likewise polygonal but much smaller than those of corn.

The internal structure of a starch granule is highly complicated, the material being in layer form, somewhat like an onion. In addition, there is evidence that the basic starch molecules are actually arranged in the orderly pattern of a crystal. The linear molecules have many branch chains which intermingle and adhere together in places; it is this thread-like structure which gives rise to many of the characteristic physical properties of starch.



The various parts of a maize grain.

Machines unloading ships at the wharf drop the maize down standpipes on to this conveyor, in a tunnel under the wharf, which goes to the silos.

Maize starch

Starch is an essential item in the human diet. As found in grains and vegetables, it supplies much of the body's carbohydrate requirements.

As milled in maize refining plants, starch and its derivatives, such as syrups and sugars, are widely used in confectionery, ice cream and other frozen desserts, canned and frozen fruits, soft drinks and beer.

Blancmanges, custard powders, gravies and soups contain it as an essential ingredient, and indeed its uses in the domestic kitchen are too well known to need elaboration. It is also an important material in the manufacture of many non-food products that are necessities in modern life, such as paper, textiles and adhesives, and in such varied processes as printing, ore-refining, oil-well drilling and the casting of iron and steel.

Although starch may be extracted from numerous plants, only a few yield it in commercial quantities, and of these, maize is by far the greatest source. Maize is the largest U.S. agricultural crop, exceeding three thousand million bushels annually in recent years. Maize is imported into this country from South America and South Africa as well as from the U.S.A.

The variety processed almost exclusively by the refiners is hybrid yellow dent corn, so named because each grain has a characteristic dent in the top. The structure of such a grain is shown in the diagram. It can be split up into four principal materials:

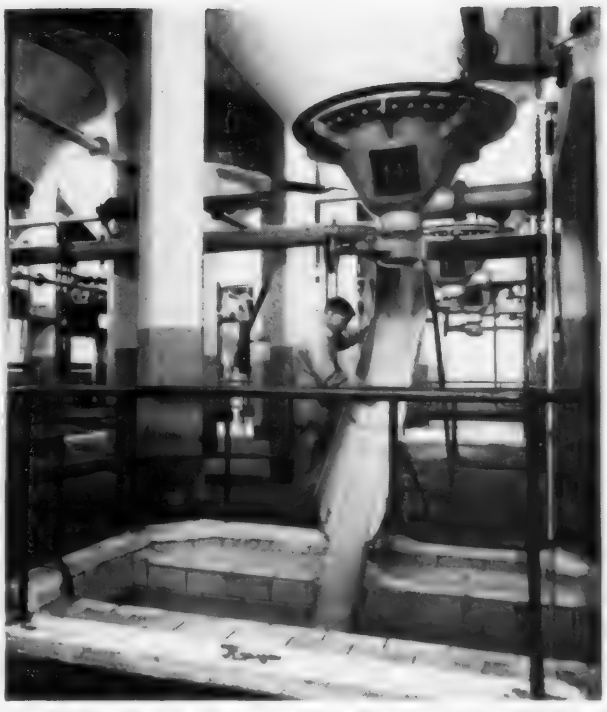
starch, comprising about 71% of the grain by weight on a moisture-free basis; the main object of the milling process is to obtain as much pure starch from the grain as possible;

gluten, whose main constituent is protein, and which is used principally for animal feed;

germ, which contains most of the oil, plus some protein and starch; and

fibre, the covering or hull of the grain, which is the least valuable part commercially and which is used for animal feed.

The refining process separates these four constituents in the following order: germ, fibre, gluten, starch.



(*Left*): **Running the steep corn from the steep tanks. In the gulley, process water picks up the corn so that it can be pumped to the degerming mills.** (*Right*): **These "Contessa" centrifugal filters are used to dewater the husk material before further drying.**

Refining process

Maize starch milling is a "wet milling" process in which at every stage the materials are suspended in water, and from one stage to the next they are conveyed in slurry form through pipes. The process begins with the shelled grain, which is cleaned to remove pieces of cob and any foreign substance. Cleaning is accomplished by currents of air which remove unwanted light material, sifters which remove heavy foreign particles, and electromagnets which take out tramp iron.

The cleaned grain is then soaked or "steeped" for about 40 hours in warm water slightly acidified with sulphur dioxide, which prevents undesirable bacterial fermentation and helps to extract the soluble matter from the grain. It also softens the hull, a very important factor, and loosens the protein-starch complex, making the subsequent separation much easier.

When steeping is complete, the steepwater is drawn off and the softened grains are run through attrition mills which break up the grain and free the germ. The wet macerated kernels are washed into germ separating tanks, where the germs, being lighter than the rest, float to the surface while the other particles settle to the bottom. The germs are skimmed off and the residue, consisting of starch, gluten and fibre, is finely ground.

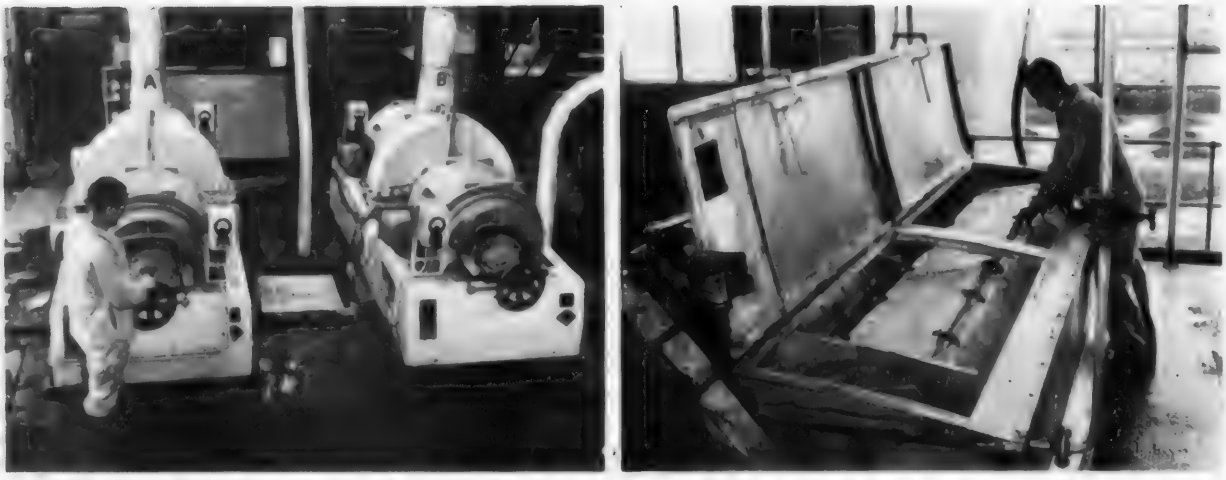
The resulting ground mash is first washed through a series of shakers having nylon screens; starch and gluten slurry pass through, while the coarser particles of fibre are retained. There now remain only the starch and gluten to be separated; this was formerly done by flotation in very long gradually sloping troughs known as "starch tables," where starch settled to the bottom and gluten, being lighter, flowed on over the bottom end. Today, this process is carried out much more effectively in centrifuges.

The starch, still in slurry form, is washed several times, and may be finally dried and packed or given further treatment to produce speciality starches, such as pregelatinised starch for "instant" foods, or glucose syrups, dextrose sugars or dextrines. The last, although industrially important, have little food use.

The other products of the refining process have various uses. The steepwater contains valuable proteins, carbohydrates and minerals, and is used as a nutrient medium for growing the moulds which produce penicillin, aureomycin and other antibiotics. Oil is extracted from the washed and dried germ and is refined for table and cooking use and for use as an ingredient in salad dressings. The pressed cake from which the oil has been extracted is ground for use as animal feed. The fibre and gluten, mixed with some of the steepwater, becomes maize gluten feed.

The Trafford Park Factory

This enormous plant, recently expanded at a cost of over £3 million, is claimed to comprise the largest wet-milling factory and the largest glucose refinery in Europe, and has now been in full operation since 1958. By its construction, the firm reduced its need to import manufactured starch. Not only is raw maize much cheaper to buy, but by refining it over here the valuable by-products, formerly imported at great cost,



(*Left*): **Final grinding of the maize kernel is carried out in these refiners. Precise control of grinding is essential to ensure clean separation of the starch and gluten and also to prevent the husks being ground so finely that removal is difficult.** (*Right*): **Husk is removed from the starch and gluten in these nylon-cloth covered reels. Ground maize from the refiners enters at one end of the reel, the starch and gluten passing out through the cloth walls. Fibrous material drops from the end of the reel.**

are also produced in this country as well.

The factory stands on the site of the earlier Corn Products glucose refinery beside the Manchester Ship Canal. Ocean-going grain ships carrying up to 10,000 tons of maize from North and South America and from South Africa, moor alongside the company's wharf and discharge their cargoes directly to the grain silos.

The factory is divided into a number of separate sections, each with its own group of buildings, to deal respectively with the milling of the starch, its drying and packaging, the conversion of starch to glucose and sugars and their refining, the production of special starches, and the production of dextrines for industrial use. There is, in addition, a power house to supply the huge demand for steam and electricity.

The silos

There are eight cylindrical storage vessels, built of prestressed concrete, rising to a height of 120 ft. above ground level. They are arranged in two rows of four in such a way that the diamond-shaped spaces between the storage vessels form three more storage spaces, providing eleven storage vessels with a total capacity of 14,000 tons of grain.

Shiploads of maize arrive on a carefully arranged schedule. The cargoes are unloaded by suction by means of two pneumatic travelling elevators which can offload maize at the rate of 125 tons/hour each. The maize is discharged through manholes to a shallow V-belt conveyor running in a tunnel along the length of the wharf, which takes the maize past a magnetic extractor to an automatic weigher. All payments on the maize are made on the amount of maize registered by the weigher. The maize is conveyed to the top of the silos by elevators and distributed to any of the storage vessels. The system of conveyors and elevators can be used, if necessary, to turn the grain over from one storage vessel to another to prevent overheating of the grain. Each of the storage vessels has a conical bottom which discharges to one of two belt conveyors. This also is fitted with a magnetic device for removing tramp iron. Grain that is withdrawn from the silos is cleaned and reweighed, so that the grain is weighed twice, once when being offloaded, and again when it is being drawn from the silos for processing. As the grain is discharged from the weigher, it is mixed with water to form a slurry which is then pumped to the mill house.

The mill house

The first process is to steep the maize in water containing 0·1-0·2% sulphurous acid. This is accomplished in large vertical tanks holding up to 70 tons apiece. Leaching is carried out countercurrent fashion, the steep water being recirculated from one tank to the next, beginning with the grain which has been steeped for the longest time and ending with the tank which has just been filled with fresh grain. Total steeping time is 42 hours. During this process the maize kernels soften appreciably and at the end of it contain about 45% of moisture.

After steeping the kernels are pumped in a current of water to mills known as "foos mills"; these are, in effect, pin disc mills, one disc being stationary while the other rotates. In these mills the grains are macerated and the germs freed without being crushed. The maize is milled and separated in two passes; in the first pass, it is run through two foos mills to two separating tanks in parallel; these tanks are rectangular in shape and have a U-section, and the slurry from the mills is pumped in at one end. The freed germs float to the surface and their passage to the other end of the tank is assisted by slowly-rotating paddles. The germs overflow from the other end of the tank while the heavier material is withdrawn from the bottom. The latter is run once again through another pair of foos mills and then to a second

at the

Water + SO_2
Manchester
RAW MATERIAL
Shelled maize is bought in S Africa, USA and S America
SHIPPING & STORAGE. Maize ships unload at the company's wharf on the Manchester Ship Canal and the grain is stored in silos
STEEPING in hot water softens the kernels for processing
MILLING & GERM SEPARATION. Careful milling releases the oil-bearing germ which is floated off in separation tanks
GRINDING & FIBRE SEPARATI
Controlled grinding frees the remai
starch constituents. Husk (fibre
removed on nylon screened reels
Corn Steep Liquor
Germ
GERM DEWATERING
Water is squeezed from the germ mechanically
Fibre (Hus

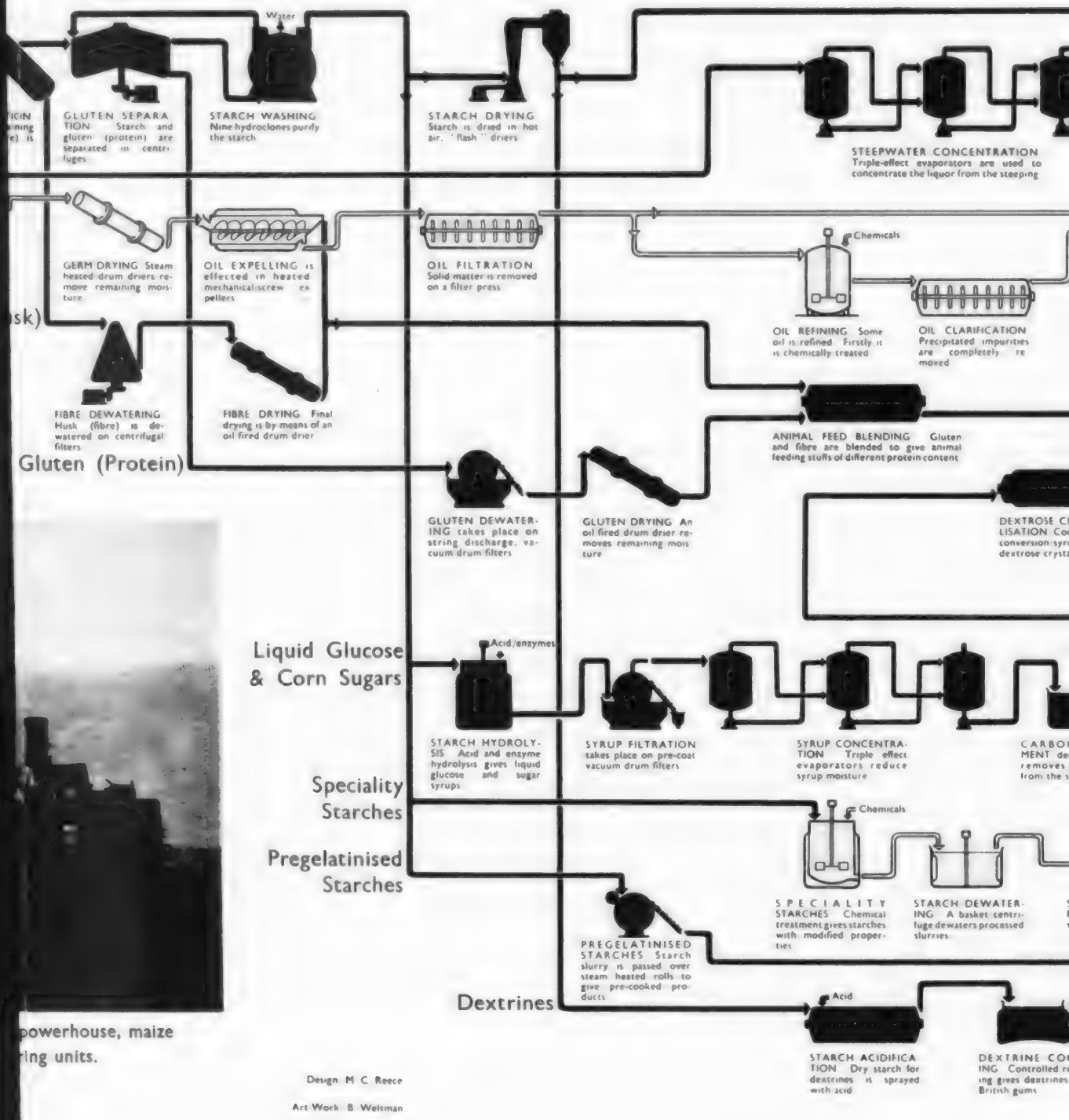
MAJOR USES OF MAIZE-BASED PRODUCTS IN FOOD MANUFACTURE

Pure Starch	Baking powder, beers, biscuits, bread, cakes, canned foods, confectionery products, custard powder, ice cream, meat products, moulding starches, pies, prepared mixes, puddings, salad dressings, sauces, soups.
Maize Oil	Margarine, salad dressings, fried foods.
Dextrose	Beers, biscuits, bread, cakes, canned fruits, doughnut coating, frozen foods, ice cream, jams and preserves.
Solid Sugars	Beers, biscuits, caramel, cakes, ciders, sauces, vinegar, wines.
Liquid Glucose	Beers, biscuits, bread, canned fruits, cakes, caramel, confectionery products, frozen foods, ice cream, jams and preserves, pickles, sauces, soft drinks, soluble coffee.
Oxidised Starches, Starch Ethers and Thin-boiling Starches	Confectionery products, jams and preserves, puddings.
Pregelatinised Starches	Beers, " Instant " foods, meat products, sauces.

This view of the factory shows, from right to left: the p
silos, wet mill, and the by-products manufactur

The Processing of Maize

e Trafford Park, Manchester, Factory of Brown & Pol


Water
GLUTEN SEPARATION Starch and gluten (protein) are separated in centrifuges
STARCH WASHING Nine hydroclones purify the starch
STARCH DRYING Starch is dried in hot air. "flash" driers
STEEPWATER CONCENTRATION Triple-effect evaporators are used to concentrate the liquor from the steeping
GERM DRYING Steam heated drum driers remove remaining moisture
OIL EXPELLING is effected in heated mechanical-screw expellers
OIL FILTRATION Solid matter is removed on a filter press
Chemicals
OIL REFINING Some oil is refined Firstly it is chemically treated
OIL CLARIFICATION Precipitated impurities are completely removed
sk)
FIBRE DEWATERING Husk (fibre) is dewatered on centrifugal filters
FIBRE DRYING Final drying is by means of an oil fired drum drier
ANIMAL FEED BLENDING Gluten and fibre are blended to give animal feeding stuffs of different protein content
Gluten (Protein)
GLUTEN DEWATERING takes place on string discharge, vacuum drum filters
GLUTEN DRYING An oil fired drum drier removes remaining moisture
DEXTROSE CRYSTALLISATION
Liquid Glucose & Corn Sugars
Acid/enzymes
STARCH HYDROLYSIS Acid and enzyme hydrolysis gives liquid glucose and sugar syrups
SYRUP FILTRATION takes place on pre-coat vacuum drum filters
SYRUP CONCENTRATION Triple effect evaporators reduce syrup moisture
CARBONATMENT
Speciality Starches
Chemicals
Pregelatinised Starches
SPECIALITY STARCHES Chemical treatment gives starches with modified properties
STARCH DEWATERING A basket centrifuge dewaters processed slurries
PREGELATINISED STARCHES Starch slurry is passed over steam heated rolls to give pre-cooked products
Dextrines
Acid
STARCH ACIDIFICATION Dry starch for dextrines is sprayed with acid
DEXTRINE COOKING Controlled reaction gives dextrines British gums

powerhouse, maize
ring units.

Design M C Reece

Art Work B Weltman

Polson, Ltd.

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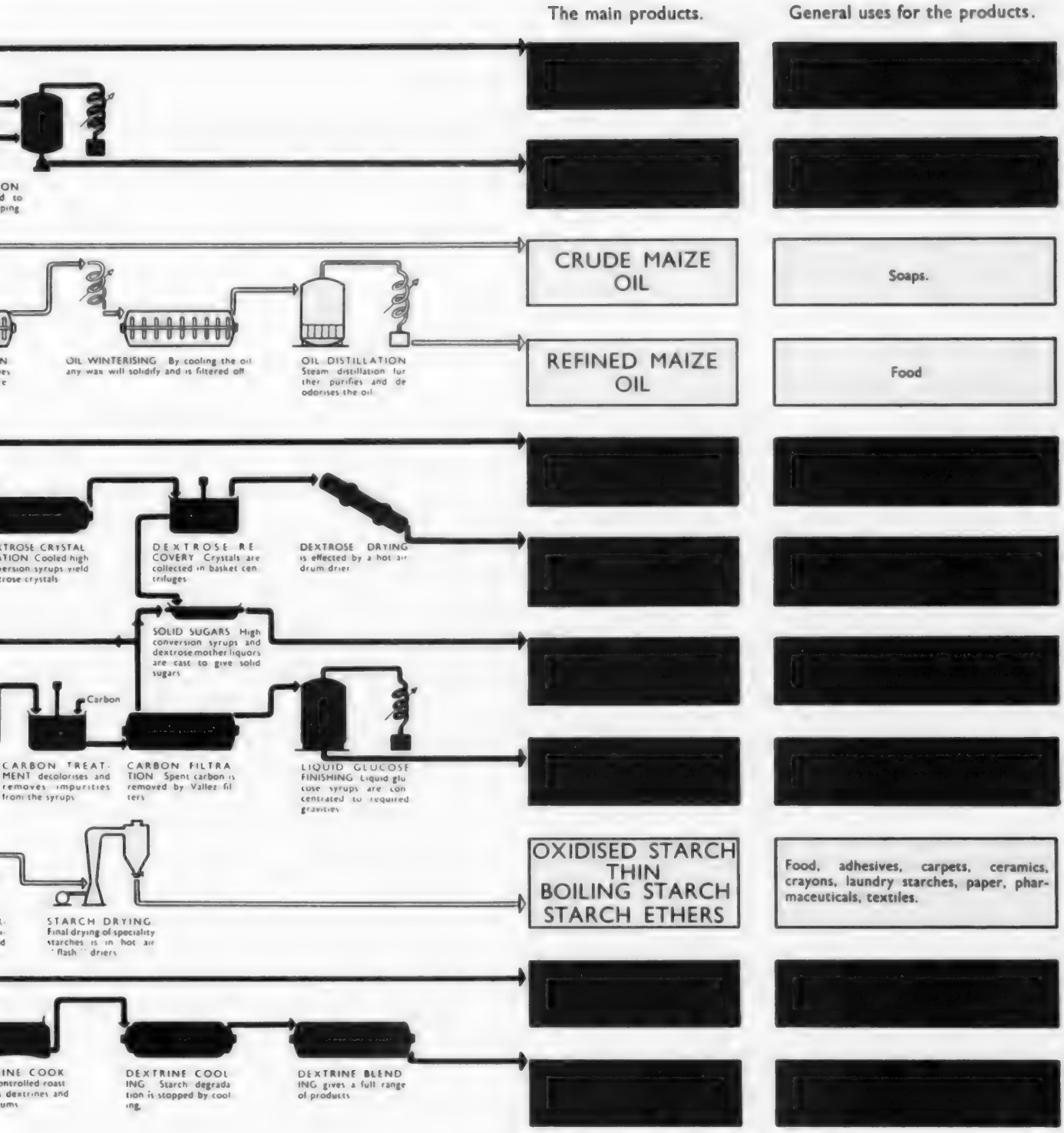
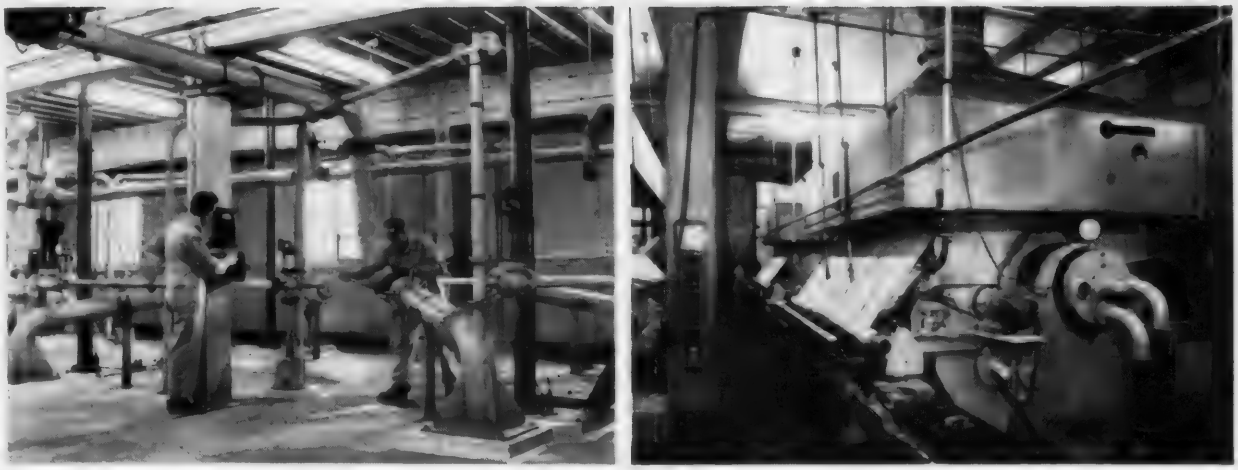
April, 1960.


The main products.
General uses for the products.
CRUDE MAIZE OIL
Soaps.
REFINED MAIZE OIL
Food
OIL WINTERISING By cooling the oil any wax will solidify and is filtered off
OIL DISTILLATION Steam distillation further purifies and deodorises the oil
DEXTROSE RECOVERY Crystals are collected in basket centrifuges
DEXTROSE DRYING is effected by a hot air drum drier
SOLID SUGARS High conversion syrups and dextrose mother liquors are cast to give solid sugars
Carbon
CARBON TREATMENT decolorises and removes impurities from the syrups
CARBON FILTRATION Spent carbon is removed by Vallez filters
LIQUID GLUCOSE FINISHING Liquid glucose syrups are concentrated to required gravities
OXIDISED STARCH
THIN BOILING STARCH
STARCH ETHERS
Food, adhesives, carpets, ceramics, crayons, laundry starches, paper, pharmaceuticals, textiles.
STARCH DRYING Final drying of specialty starches is in hot air "flash" driers
DEXTRINE COOKING Starch degradation is stopped by cooling
DEXTRINE BLENDING gives a full range of products



(*Left*): **The steep tanks charge face. One operator is coupling up a steep tank manifold to a maize supply hose. Movement of the steep water is controlled from this floor.** (*Right*): **Maize gluten (protein) is recovered by filtration. Because of the sticky nature of the wet material, rotary vacuum filters are used with string discharge.**

pair of separating tanks, where germs which have escaped the first pass are recovered.

The germ, after being recovered from the separating tanks, is pumped to the feed house, where it undergoes further treatment, to be described shortly, for the recovery of its oil.

The other constituents of the maize kernel from the separating tanks are the starch, gluten and fibre. This wet mixture is finely ground in refiners, which free most of the starch still adhering to the fibre. The ground material then passes through a series of revolving reels fitted with screens of nylon cloth. The gluten and starch are washed through the screens while the fibre is retained and rejected at the lower end. The rejected fibre is piped to the feed house, where it is used as an ingredient of maize gluten feed or maize gluten meal.

The next process is to separate the starch from the gluten. The mixture is pumped to high-speed De Laval centrifugal separators which separate the starch particles from the lighter gluten. The separated gluten passes to four De Laval concentrators where it is concentrated approximately 8-fold, and then pumped to the feed house.

The starch separated from the gluten still contains small quantities of gluten, and this is removed in hydroclones operating in 9 stages in series; they operate by a principle very similar to that of a cyclone separator. A hydroclone is a cone-shaped tube into which the starch liquor is pumped tangentially at high pressure; the heavier starch particles drop through the bottom of the cone with the "underflow" while the liquor containing the lighter gluten and soluble impurities are discharged from the top of the cone with the "overflow." The unwashed starch is introduced into the system at stage 1, but the water for washing is introduced at stage 9 and travels counter-current to the flow of starch. As there is some removal of water at each stage, the density of the starch suspension at the end of the system has been greatly increased.

The feed house

As has already been explained, the germ from the separating tanks, and the separated fibre and gluten are pumped to this building for further treatment.

The germ is first washed to removed adhering starch particles, mechanically squeezed to remove the bulk of the moisture, and dried in two steam-heated dryers to a moisture content of about 2%. The dried germ is conveyed to an oil-expelling plant, where it is pressed to remove the bulk of the oil. The crude oil is allowed to settle, and is then filtered and either sold as crude maize oil or further refined. The residual cake is sold as a feedingstuff.

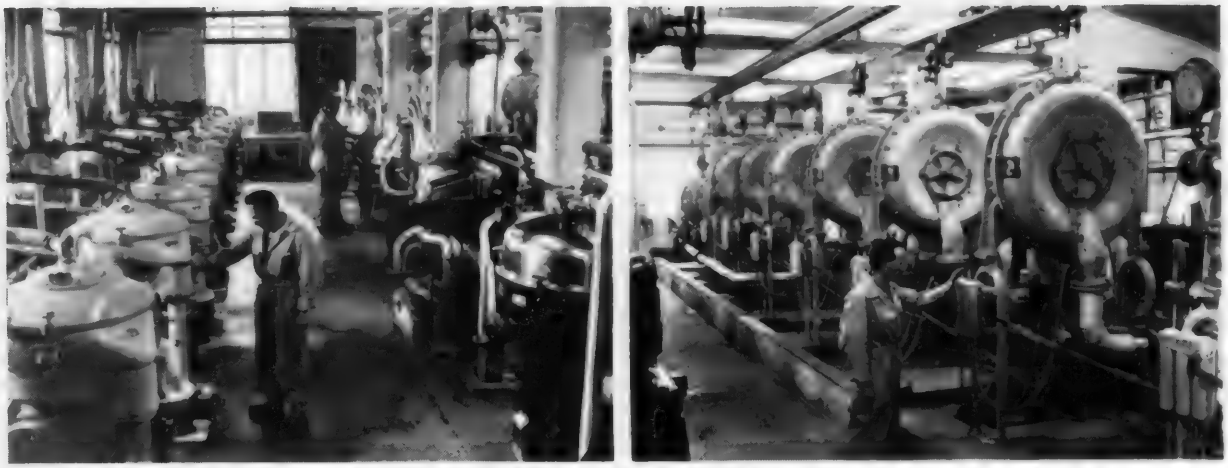
The fibre is subjected to a dewatering stage, in which the water content drops to about 70%, and is then mixed with some of the steep water from the steep tanks, which, as has been mentioned, is rich in protein and carbohydrate. Before being mixed with the fibre, the steep water is concentrated in triple-effect evaporators. The mixture is then dried in rotary dryers, ground, and compounded with gluten to make either gluten feed, containing 25% protein, or gluten meal, containing 42%, according to the amount of gluten added.

The gluten is filtered on a rotary suction drum filter fitted with string discharge. The material is dried in two oil-fired Peabody rotary dryers and then ground. It is then mixed with fibre to make either gluten feed or gluten meal, as already explained.

In the feed house, automatic control panels carry mimic diagrams of the dryers for gluten and germ, and of the triple-effect evaporators for the steep water. From these panels all these items of equipment can be remotely controlled.

Starch drying house

From the mill house, some of the pure, washed starch is pumped to the drying house, where the first process is the separation of the water by centrifuging in a



(*Left*): **A " clutter " of centrifuges ! Machines on the left are separating starch from gluten, the latter then going to the machines on the right for dewatering.** (*Right*): **Starch is thoroughly washed free of protein in this 9 stage hydroclone installation. Wash water runs through the system countercurrent to the starch.**

basket centrifuge having an automatically controlled cycle of operations. The dewatered starch is then conveyed to a hot air dryer, a tall venturi-shaped structure erected outside the building. At the top of this dryer the dried starch is separated into two streams by two cyclones, and each stream is fed through a pulveriser to an automatic weigher, from which the starch is filled into bags.

Glucose manufacture

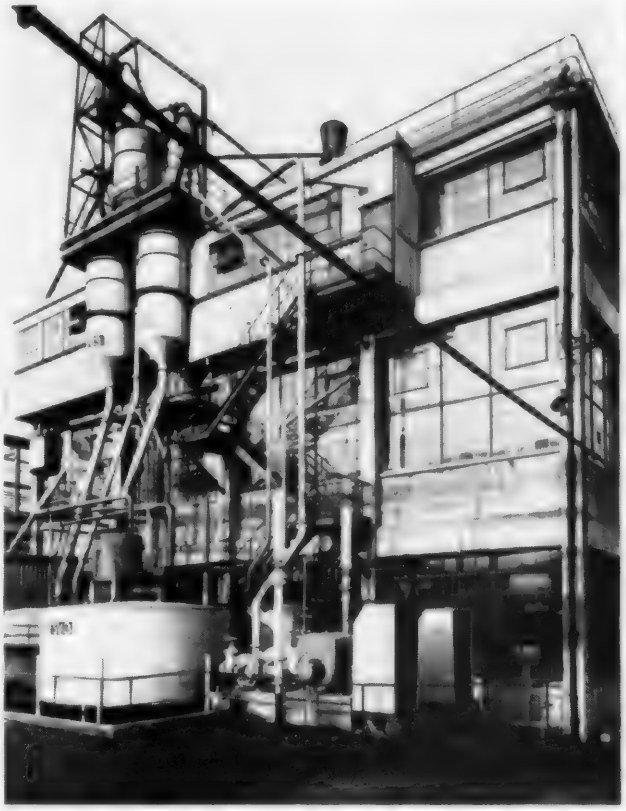
When starch is heated in the presence of weak acids, the long chain molecules are broken down in varying degrees according to the conditions of time and temperature, until in the final stage of hydrolysis, dextrose itself is produced. The proportions of the various sugars and dextrins in the final product depends on how far the hydrolysis is allowed to proceed. In the refinery, two groups of product are prepared—liquid glucose and solid sugars.

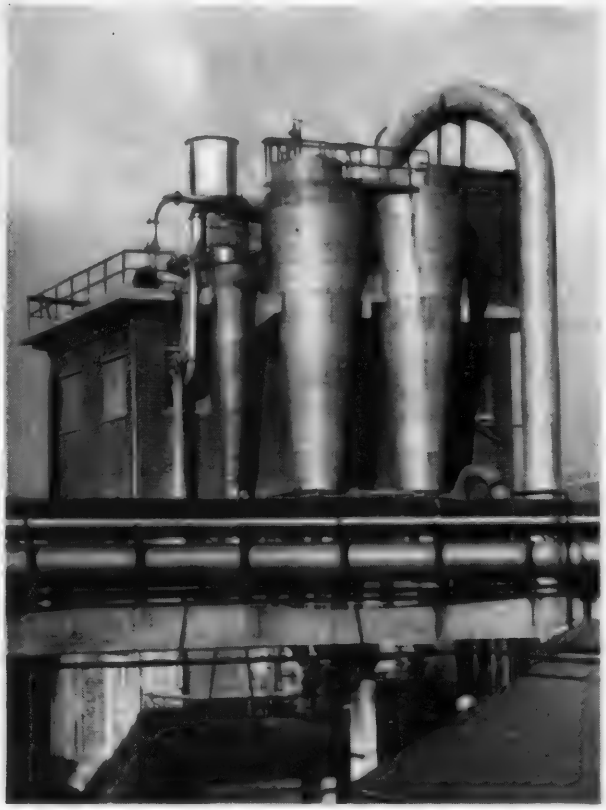
In the manufacture of liquid glucose, starch slurry from the wet mill is acidified with hydrochloric acid and heated under pressure in a bronze vessel known as a " converter." The time of heating, the temperature and pressure are laid down, but in order to check that the conversion has reached the required stage, the operator takes a sample and measures its dextrose equivalent on the spot by a simple colorimetric iodine test. When the conversion is satisfactory, the converter contents are blown up to two wooden vats and quickly neutralised with sodium carbonate. The neutralised liquor is then filtered through a rotary precoated drum filter, which removes the precipitated protein and other impurities.

After volume checks by H.M. Customs and Excise, to determine the duty payable, the liquor is passed through Vallez filters precoated with activated carbon.

The next stage is the concentration of the glucose solution in triple-effect evaporators, after which activated carbon is added to the liquor in a tank to decolorise it. The carbon is removed by filtration on clean Vallez filters. These filters now become the precoated filters used for filtering the next batch of glucose solution before the concentration process. Recycling in this way gives more efficient colour removal and con-

These machines are oil expellers which extract maize oil from the germ. Expelled cake which falls into the screw conveyor in front of the machines is used for animal feed.





Studies in industrial architecture. (*Left*): **The new glucose refinery where starch slurry is hydrolysed for liquid glucose, dextrose and powdered glucose production.** (*Right*): **Pure maize starch for direct sale is dried in these hot air "flash" dryers after a preliminary dewatering in an automatic basket centrifuge.**

siderable economy in carbon requirements.

The decolorised solution is further evaporated under reduced pressure to the desired concentration for sale. For this evaporation there is a single-effect evaporator. Finally, the liquid glucose is pumped to a set of steam-heated storage tanks from which it is loaded direct into road tankers for despatch; a small proportion is filled into drums.

To make powdered glucose, that is, dextrose, from starch, conversion is carried out in the same way as for liquid glucose, except that more acid is used and the conversion time is longer. The result is that the starch is changed almost entirely to dextrose. The neutralising, filtering and evaporation processes are exactly the same as for liquid glucose, but the dextrose is crystallised from the concentrated solution by seeding.

The refined liquor is cooled in temperature-controlled crystallisers of cylindrical shape. Dextrose crystals from the previous batch act as seeds. The solution is slowly agitated by a spiral agitator and cooling water circulated through a jacket; crystallisation is allowed to proceed for five days. At the end of this time, the soft crystalline mass, or massecuite, is run out into basket centrifuges which remove excess mother liquor. The cake is washed, scraped from the walls of the centrifuges by mechanical blades, dried, graded, packed and then sold as *Cerelose*.

Solid glucose is made by cooling a highly converted and concentrated solution in tanks and running them into trays, in which they solidify. The slabs of solid glucose are then turned out of the trays, stacked and allowed to age or cure before being either machine-cut into chips (which are sold as *Acme* or *Buffalo* glucose), or shaved on a rotary cutting machine to make *Dextrolact*. Solid glucose is used, among other things, for animal feed.

Special starches

Starches whose properties are modified for special purposes include thin-boiling starches which, when dissolved, give a less viscous solution for the same solids content and which set harder than normal starch, chlorinated starches which do not set for a long time after mixing (these are mainly used for textiles and paper-making), and pregelatinised starches for making "instant" and baby foods.

Thin-boiling starches are made by acid hydrolysis with sulphuric acid at a temperature of 128°F. for a time depending on the fluidity required, followed by rapid neutralisation, washing in hydroclones and drying.

Chlorinated starches, marketed under the name *Amisol*, are prepared by treatment with sodium hypochlorite, followed by hydrolysis with caustic soda. Here again the final properties depend on the strength of the alkali and the duration of hydrolysis. One

of the food uses of these products is in the manufacture of lemon curd.

Pregelatinised or precooked starches are made by feeding a slurry of starch in water to the surfaces of rotating steam-heated steel rollers. While in contact with the hot surface the starch is cooked and dried, and it is then removed in the form of a thin "curtain" by a scraper blade. The dry material falls into a hopper beneath each roll and is milled, sifted and packed.

An important section of the special starches division is devoted to making dextrines. These are made by dry-roasting starch with an acid catalyst sprayed on to the starch with continual churning in mixers. The starch must be very dry, otherwise some will be hydrolysed to sugar and the product will be hygroscopic. A very large range of products can be produced by varying the processing conditions; some products are completely water soluble and their uses include adhesive manufacture, foundries, textile finishing, carpet backsizing and many other non-food uses too numerous to mention.

* * *

This necessarily rather superficial description of a large starch plant does give some idea of the very extensive range of products obtained from one single variety of agricultural crop, namely dent corn. Their uses in food and non-food products are legion, as the summary shown on the illustrated diagram indicates. As the largest producer of starch and its derivatives on this side of the Atlantic, Brown and Polson affects every household and nearly every factory in the country; it is not surprising, therefore, that high purity is the first consideration of this firm. Whether material is intended for food, non-food uses, domestic applications such as laundry starch, or for heavy industrial applications, the same high quality is apparent. The company's motto might well be: "Make the best and use it for everything."

SUPPLIERS OF EQUIPMENT

Alfa Laval and Co., Ltd.: centrifuges.
Blairs, Ltd.: triple effect evaporators.
John Booth and Sons (Bolton), Ltd.: cookers and blenders.
Davey Paxman and Co., Ltd.: vacuum drum filters.
Dorr Oliver, Ltd.: hydroclones, starch machinery.
Wm. Gardner and Son, Ltd.: foos mills.
Holst and Co., Ltd.: silos, concrete structures.
International Combustion Co., Ltd.: *Contessas*.
Kestner Evaporator and Engineering Co., Ltd.: evaporators.
F. R. and M. Harris, Ltd.: reels.
Mirlees Watson and Co., Ltd.: Vallez filters.
Potts, Cassels and Williamson, Ltd.: fibre and gluten driers.
Rose Downs and Thompson, Ltd.: germ expellers.
Simon Handling Engineers, Ltd.: grain handling equipment.
Richard Simon and Sons, Ltd.: rolls.

BOOK REVIEW:

Food Additives and Contaminants

In modern food technology, the problem of foreign matter in foodstuffs has become exceedingly important. Intentional additives comprise a great variety of protective agents, added at different stages of food processing against many different degradations. In most cases, knowledge about the effects of food additives, intentional or otherwise, is still in a state of flux, and is dispersed over a multitude of technical publications throughout the world.

The authors of this work* have performed a signal service in collecting all the relevant data on the composition, toxicity, applications and analysis that have become known in recent years, and presenting them systematically in tabular form and in such a way that the collection can serve as a reference book *par excellence*.

Being, respectively, the Director and a Scientific Member of the German Research Institute for Food Chemistry, Munich, the authors were in a privileged position to draw on the pool of knowledge available at the Institute, and they have done so most completely.

In their introduction, they provide a most useful synopsis of the different kinds of food additives, of the different reasons why they are added, and of the criteria which have a bearing on their application.

The tables themselves follow a very detailed systematic classification, under the main headings of intentional and non-intentional additives.

The former include the widely varying groups of enriching, seasoning, improving, water treatment, preserving and other agents, etc.

With non-intentional additives, a distinction is made between substances entering the food, respectively, through the agricultural produce (such as fertilisers, fungicides, insecticides, herbicides, etc.), or during processing or storage, or as a result of physical treatment or other reactions.

In this way, some 400 different agents are tabulated. The particulars listed in the tables include, in each case, the chemical composition, commercial brands, toxicity data, and a very full account of applications, legal proscriptions, analytical methods, etc. All these data are culled from over 1,600 sources which are listed in what must surely be one of the most exhaustive bibliographies on the subject. Further, aids are provided in the form of three alphabetical indices of authors, foodstuffs, and food additives, respectively.

The authors modestly disclaim comprehensiveness; it would indeed be impracticable to attain comprehensiveness in such a vast and continually expanding sphere. But the authors have certainly succeeded in providing a most useful synopsis of the present state of knowledge on the important subject of food additives.—E. R.

* *Fremdstoffe in Lebensmitteln, mit besonderer Berucksichtigung der Konservierung* ("Foreign matter in foodstuffs, with special regard to food preservation"). By S. W. Souci and E. Mergenthaler. (In German.) J. F. Bergmann, Munich, 1958. Pp. iv+307. (Cloth-bound.) DM. 48 net.

FOOD MANUFACTURE
ANNUAL REVIEW

Canning and Freezing

By Denis Dickinson,* Ph.D., F.R.I.C.

Strawberries ★ vegetable texture ★ composition ★ peas ★ sterilisation ★ nisin ★ corrosion of cans ★ enzyme activity ★ frozen food packs

LOOKING through the reports, papers, and abstracts relating to fruit and vegetable canning and freezing that were published during 1959 has revealed nothing of obviously outstanding importance although there were several which showed promise of developing into major advances in future years. This might, therefore, be a useful occasion on which to review progress since this series of articles began five years ago and to take stock of problems solved, of problems by-passed, and of those still with us.

Strawberries

Five years ago much space was devoted to the failure of the strawberry variety *Auchincruive Climax* and to the search for a suitable variety to replace it. This search still goes on and no completely satisfactory variety has as yet appeared. Nevertheless, several of the new Cambridge varieties are generally very suitable for canning, particularly *Cambridge Favourite, Cambridge Vigour,* and *Cambridge Prize-winner.* These are not yet as widely grown as the old favourites *Royal Sovereign* and *Huxley,* because it takes several years to get a variety established.

A criticism that has been made of this research is that it is of little practical value if the prize for suitability for canning is awarded to a variety that is available only in very small quantities. Certainly it is true that the bulk of the strawberries grown and canned are of the variety *Huxley* (or *Brenda Gautrey*), but this does not make it a desirable variety for canning. It is unsuitable for many reasons and canners would do better not to encourage it. Peas for canning or freezing are grown specially for the purpose to a scientifically designed plan. The time should not be far distant when strawberries for processing will be grown on a similar basis.

Vegetable texture

Although the last word as to the suitability of a variety of a fruit or vegetable for processing must not be given until after a series of practical trials has been completed, much is possible in the way of selection of materials by chemical and physical tests. The laboratory testing of broad beans for suitability in regard to colour was reported in 1957; a subsequent report[1] has shown that the texture of the beans may be related to the same class of chemical compounds as those responsible for unsatisfactory colour. A variety that is satisfactory in regard to colour is, therefore, likely to be of satisfactory texture also.

This same paper reports the use of both the tenderometer and the texturemeter for the measurement of the texture of broad beans. Canners are finding instruments of this kind increasingly useful in the selection of crops of leguminous vegetables for canning.

Composition

The chemical composition of fruits and vegetables has called for comment every year and it appears that research in this field is increasingly active, particularly at centres overseas. It is of considerable practical importance to know whether the application of fertilisers affects the composition of peas for canning. A German report on comparative trials with calcium cyanamide and calcium nitrate claimed that there was no effect on the quality of the peas.[2]

The tomato is also an important canning crop in many countries and an investigation of the effects of cultivation and environment on the composition of the fruits of several varieties has been carried out in Hungary.[3] It is, of course, quite well known that plant growth varies with growing conditions and it is to be expected that chemical composition will vary in like manner; however, some of the results of this Hungarian investigation were unexpected. The solids content of the fruit, for example, was found to be increased considerably by setting more plants in the same area.

Many other factors affect the solids content and it can not be said to be a property characteristic of a variety. On rich fertile soils, higher solids content goes with larger crops; but this is not generally true on poor soils, when differences between varieties become more pronounced. The colour of varieties was not correlated with solids content.

Reports on tomato varieties in Italy are, of course, the prime concern of the Research Station at Parma,

* The Fruit and Vegetable Canning and Quick Freezing Research Association, Chipping Campden, Glos.

which has published several reports in recent years.[4] This station has also give much attention to pea varieties and recently issued an informative report in which the composition and structure of mature fresh and processed peas are compared in detail.[5]

Peas

Until a few years ago, processed peas were canned only in the United Kingdom, but European canners have now begun to produce increasing quantities of this pack. Owing to somewhat different ideas on quality it appears to be possible and profitable in certain areas to pass off processed peas as mature garden peas and even mixtures of the two are said to be on the market. Consequently it has become important to be able to distinguish by analytical means between the two kinds of pea. The report from Parma goes a long way towards making this possible, although the analytical procedure is somewhat laborious.

The fundamental problem of pea texture was referred to in 1955, and little real progress has yet been made. An interesting study of the absorption of calcium by peas was made by de Proost and Kirchmann in Belgium and reported in a special publication from the Centre d'Etude d'Energie Nucleaire.[6] By using radio-active calcium it was possible to follow the absorption and the migration of calcium in the growing pea plant and in the seeds. Although the investigation was no more than exploratory, it was of particular value in demonstrating the utility of this method of experimentation, and it will certainly prove useful to the small research team recently established at Campden Research Station to investigate this whole problem of pea texture.

Sterilisation

The use of hot air for the sterilisation of cans was first referred to in the review for 1956, when the Ekelund system was described. By 1958 the writer was able to visit a second type of machine, actually in operation in a French cannery. There are now several hot-air sterilisers either working or under construction in canneries overseas, mostly dealing with milk and cream products for which they have particular advantages.

In this country interest has centred mainly around the hydrostatic type of cooker, many of which are now to be found in British canneries. The problem of corrosion which is peculiar to this type of machine does not yet appear to be capable of general solution.

The review for 1956 contained a strong argument against the proposal to use radio-activity for the sterilisation of foods and quoted C. O. Ball as authority for stating that the whole idea was illogical. No subsequent development has altered this point of view, although it was clearly not shared by the majority. The news that the U.S. Army has now cancelled its research project in this field because the treated food was found to be unsafe for animals[7] comes as no surprise, but at the same time it affords little satisfaction because the reason adduced is not the right one. Industrial research establishments are said to have discontinued research because of induced flavour changes.

Nisin

On several occasions mention has been made of the possibility of the use of an antibiotic—nisin—in canned foods to control flat-sour infection. Nisin is not a preservative in the ordinary sense, nor is it a synthetic chemical. It occurs naturally in cheese and has been consumed without ill effect for a long time. Unlike penicillin and streptomycin, nisin has virtually no medicinal value. Nevertheless, the heat resistant spores of flat-sour organisms do not develop to spoil cans of vegetables to which small quantities of nisin have been added.

Spores of flat-sour organisms are among the most resistant to heat; certainly they are much more heat-resistant than those of *Clostridium botulinum*. It has, therefore, proved impossible to kill all the spores normally present in canned vegetables without at the same time grossly overcooking the vegetables. The addition of a small quantity of nisin overcomes this difficulty, and if the recommendations contained in the Food Standards Committee's "Report on Preservatives in Food"[8] in regard to nisin are adopted it will become a permitted additive.

Clearly, there was a danger in the use of a material of this kind in that canners might be tempted to reduce their processes too far and thus introduce a risk of the survival of *Cl. botulinum*. This risk is neatly avoided by the definition of canned foods in which the use of nisin would be permitted as "foods in hermetically sealed containers which have been sufficiently heat processed to destroy *Clostridium botulinum*, or the *p*H of which is less than 4·5."

The possibility of the use of nisin to control flat-sour spoilage is a matter of great importance, but it is not universally welcomed even by all canners. In some countries, the canner is still engaged in perpetual war with those opponents of canned foods who indulge in continuous propaganda against "preserved foods" and the "chemicals" they contain. Even in the U.K. the Director of the Consumers' Association recently declared: "There is certainly quite a number of people who *do* believe that there is too much preservative in tinned foods."[9] The reason underlying this mistaken belief seems to be the complete absence of informative lay literature to tell the public at large that canned foods contain no preservative whatsoever; yet in other countries there is no such lack of information, and in spite of it, the myth persists. One can, therefore, imagine the difficulty that might be created if nisin became a well-used ingredient.

Perhaps the answer is to be found in plain language, giving a straight answer to the question "Do canned foods contain preservative?" The answer at present is "No"; any reservation on the grounds that sugar and salt are capable of preserving foods under certain circumstances does not amplify the answer to the question, but merely confuses the issue.

Even when nisin is used, the answer to the question will still be "No" because the residual nisin is normally less than 1 p.p.m., and even this disappears in many cases within a few days.[8]

Corrosion of cans

The internal corrosion of cans by fruits was still an important problem in 1955 and the following year a brief report was given of researches into the fundamental causes of corrosion in both plain and lacquered cans. Then in 1957 the connection between residual enzyme activity in stone fruits and excessive corrosion was discovered as a result of which a new basis appeared on which to judge the adequacy of a heat process for fruits.

When packing stone fruits in lacquered cans the process must be sufficient to inactivate the enzymes present in the stones; otherwise excessive corrosion of the can will result. Following this no further trouble has been experienced from corrosion of lacquered cans. Several instances of the corrosion of plain cans have been met and the reason for accelerated corrosion—sometimes extremely vigorous attack—remains rather mysterious.

In all the controlled experiments done to test the effects of residual enzyme activity, no connection with accelerated corrosion has ever been traced in plain cans.

Enzyme activity

Persistent enzyme activity as a result of inadequate blanching has been referred to many times, both in respect of canned foods and of frozen foods. In the latter the effects are generally much more serious, resulting in loss of colour and almost complete loss of flavour.

A different explanation of the same general observation is given by some American research workers whose most recent paper adds practical support to their view.

Briefly, they consider that the flavour of fresh foods is due to substances which are produced by enzyme-induced changes which are part of the natural respiration processes of the vegetable cells concerned. During processing—particularly during blanching—the substances responsible for fresh flavour are largely removed while the enzymes responsible for the formation of these substances are inactivated.

The flavour of the processed material is, therefore, different from that of the fresh. However, the precursors of the flavouring materials remain largely unchanged by processing, and the re-introduction of active enzymes should result in a reappearance of fresh flavour due to the formation of more flavouring substances as the result of action of the enzymes on the precursor substances.

The latest report[10] claims that by treating processed foods with a preparation of "flavour enzymes" it has proved possible to revive the fresh flavour of the foods. Tasting panels apparently had a distinct preference for the fresh flavours.

Frozen food packs

The choice of packages for frozen foods still seems to be made very largely on the basis of sales appeal or personal preference. The importance of choosing the right material for the job apparently receives scant attention. A great deal of useful work has been done by the Western Regional Research Laboratory in California, and published under the general title "Time—Temperature Tolerance of Frozen Foods." This was not primarily intended to test packages; nevertheless the reports have included such statements as "Chickens in the more permeable package had less than one-third the storage life of chickens in the less permeable package."[11]

The rather odd title "Reveal Ratings on Flexibles for Frozens"[12] effectively conceals some useful information on the behaviour of transparent wrappings for frozen foods, which might perhaps be summarised in the statement that the better the quality of the wrapper, the better was the food after storage. Transparent wrappers introduce another hazard—that of bleaching by light, and this was investigated by A. D. Shepherd.[13] He found that pronounced colour change occurred in packaged peas in as little as four days at 20°F., and that after one week the flavour also was unacceptable.

At 0°F. the rate of change was much slower, but even so serious alteration of chlorophyll occurred in three weeks. Another change which was observed was the accumulation of snow in illuminated transparent packets.

It is fair to conclude that considerable progress has been achieved by the canning industry during the last five years and several problems of long standing have been solved. Even so, many problems remain. The need for research and for the application of the findings of research is one of the basic requirements of a modern industry.

It is no mere coincidence that although the canning industry celebrates its 150th anniversary this year, its era of real progress in this country dates only from the establishment of its own research station at Campden in 1923.

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WORLD FOOD SUPPLIES—3

Choice of Foods

By Francis Aylward,* Ph.D., D.Sc., F.R.I.C.

The third of this series of articles outlines the basic facts of nutrition, discusses the different food habits of various peoples of the world, and shows how nutritional assessments must take into account indigenous non-staple foods which, however repugnant they may be to sophisticated Westerners, are the result of accumulated age-long wisdom. Drastic changes in these indigenous food habits might lead to widespread malnutrition.

IN the assessment of the nutritional state of any individual, community or group of communities, certain standards of comparison must be used, but the establishment of these standards is by no means an easy task, although all-important if statistical data are to have any validity. Before standards can be obtained, agreement must be reached on the principles of nutrition and dietetic practice, as revealed by the scientific investigations of the past 50 years, and as illumined by the traditional dietary habits of mankind.

PRINCIPLES OF NUTRITION

There is no great difficulty in obtaining agreement on certain basic principles of nutrition which may be summarised under five headings:

Primary principles

(i) Food consists essentially of seven important groups of substances:[1,25] carbohydrates; fats and related compounds; proteins —composed of units known as amino-acids; vitamins and other accessory factors; minerals; water; roughage or indigestible material; and to these must be added oxygen, supplied from the air and essential for life.

(ii) Food is required by the body to supply *energy* for vital processes and for activity, and also to supply *essential nutrients* for growth, for the replacement of tissues and for special needs, as in pregnancy.[2, 8, 18, 19, 32]

(iii) Three groups of food components (protein, minerals, vitamins and other accessory factors) are required in daily quantities as nutrients. Certain fatty acids may also be necessary.

(iv) Energy requirements for the body are met primarily by the "combustion" of two groups of foodstuffs (carbohydrates and fats) but can also be met in part from proteins.

(v) There is no ideal *diet* but there are many excellent *diets*, in that within wide limits the diet can be varied providing that the foods chosen, taken together, supply between them the special *nutrients* and also energy-yielding components (*aliments*) in adequate quantities.[12, 14, 37]

The above principles have been established by investigations on experimental animals as well as on man, and much information is now available regarding the fate of the various food components in the body and about their rôle in health and disease. It is known that wide differences occur between individual requirements, which vary with sex, age and weight, bodily activity, environment, and with physiological conditions such as adolescence and pregnancy.[12, 14]

The major part of the quantitative information on nutrition has been obtained in Europe or in North America, from Western people living in their typical, even if varied, environmental conditions. It is often assumed that the data obtained have universal validity, but it is evident that many more qualitative and quantitative studies are necessary, especially in tropical and semi-tropical areas and on many different racial groups with their own dietary patterns.[6, 13, 29]

Secondary principles

Because European and North American laboratories and clinics have been responsible for so many discoveries in the field of nutrition, it is only natural that the practical applications of the science of nutrition should have made most progress on those two Continents, and in related communities elsewhere such as in South Africa, New Zealand and Australia. It is equally clear that the foodstuffs that have been examined in the greatest detail are the typical European and North American foods, such as meat, milk, eggs, wheaten bread; many of the foods consumed in other parts of the world still await full investigation.[49] Consequently there have been established certain dietetic codes, perhaps ideal in the United States or Europe, but not necessarily of equal validity everywhere.

These *secondary principles* of nutritional practice, such as the necessity for milk or orange juice, are widely accepted; they are often held with great tenacity and have found their way into many

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A laboratory for examining foods of animal origin (meat, fish, milk, etc.) has been established in Israel with equipment supplied by F.A.O. This picture shows Mr. Aage Jepson, of F.A.O., and Mrs. Dafnier in the laboratory, where investigations are made into improvements in hygiene and handling.

reviews, national and international, on food problems. Almost invariably the foods which are given high priority in these dietetic codes are foods which are relatively expensive and unavailable in many tropical or semi-tropical areas.[23, 52]

Several examples could be quoted from recent books and articles in which authors have assumed there must be malnutrition in a particular area because of the absence from the diet of milk and other foods which are known to be normal and desirable in Europe and America.

CHANGES IN FOOD HABITS

There are often wide differences between the food habits of different countries, and many people are apt to believe that their own national dietary pattern is superior to that of a neighbouring country, and at the same time to forget the many changes that have taken place.[3, 4, 5, 17, 45]

Regional food patterns

It is true that for many centuries the food habits of several Western European countries remained almost unchanged, based as they were on the triple formula of Mediterranean life — the wheat grain, the olive and the vine.[22, 24] Similarly in Central and Eastern Europe there are dietary patterns of long standing, notably the use of rye as a staple cereal. It was Goethe who said 150 years ago, that white and black bread provided the shibboleth which distinguished the Gallic and Germanic cultures, but one of the most interesting examples of dietary trends may be seen in the gradual adoption of white bread beyond the Rhine; since Goethe's time the wheat frontier has moved so that today it is not very different from the Iron Curtain which divides the Continent.

The discovery of America led to the introduction into Europe of many new foods, notably the (so called Irish) potato, indigenous to Central America, which has become an important staple food in several countries.[50]

Likewise the opening up of other continents has brought to Europe a variety of crops of which the soya bean (indigenous to Asia) is perhaps the most important recent example. Over the past half-century, European and American food habits have changed both in staples and in lesser foods, and it is easy to discern the effects of the increasing ease of communication as well as the advances of technology.[15, 17]

Change from vegetable to animal foods

One important feature of the change in public preferences both in Western Europe and in the U.S.A., is the decreased *per capita* consumption of the relatively cheap vegetable foods (such as wheat bread and potatoes) with a corresponding increased *per capita* consumption of more expensive[37] animal foods (such as meats and dairy produce) together with fruits and fruit juices. These trends are clear from the 1937 League of Nations report[33] as well as from more recent national[30, 38] and international reports.[34] There has been a continuous decline over the past half-century in the *per capita* consumption of bread in the U.S.A.[51, 70] and a similar, although smaller decline in the United Kingdom,[3] and to a lesser extent in Continental Europe.[33] It is said that the daily ration of bread in the U.S. Navy is now only one-third of that in the corresponding French service.[58]

The subject of dietary trends is reviewed in reports from the Food Research Institute of Stanford University,[51] and also by Booher[52] and other American authors.[4, 45] The changing patterns in Continental Europe may be seen from surveys such as those by Tremolieres and his colleagues[68, 69] in France. Up to a point, these dietary trends may be beneficial and desirable, but there is abundant evidence to suggest that they have gone far beyond the stage of necessity[52, 59] and that many Americans (and also Europeans) may be eating a far greater percentage of the more expensive foods than they need (see recent discussions on the incidence of coronary disease).[60]

The firm faith in the superiority of one's own national food habits was well illustrated by a distinguished American professor of physiology who visited Russia as a leader of a medical relief team after the First World War. He saw American women (and college graduates at that!) bursting into tears on seeing for the first time the Russians eating black bread. "Yet," said the professor speaking at the end of the last war, "it

is the thing that keeps the Russian going.''[46]

Change to more refined foods

A characteristic feature of the change in food habits in Western countries has been the increasing demand for more "refined" foods such as white flour and white sugar, in spite of the fact that it is now well established that many "refined" foods have a lower nutritive value than the cruder materials from which they are derived. Thus a white wheaten flour representing perhaps 70% of whole wheat is deficient in certain nutrients originally present in the wheat grain. In the Orient the analogous practice of using highly milled (or "polished") rice also produces deficiencies which do not occur when the whole rice is eaten.[13]

Western milling techniques were introduced and a taste for white bread developed some decades before the biochemical distribution of the wheat grain components was known and before the importance of the different nutrients was appreciated. There is a voluminous scientific and medical literature on this subject,[7, 9, 10, 20, 31, 59] and even though it may be agreed that in many Western communities the deficiencies are made good by other constituents of a mixed diet, it can also be urged that the milling techniques should not be "recommended for export" to countries where the diet may be deficient in other directions.

IMPORTANCE OF INDIGENOUS FOODS

Food firms in Western countries are now well aware of the necessity of examining new food processing procedures in the light of possible nutritional effects and it is clearly of supreme importance that firms proposing to operate in developing areas in Asia and other continents should examine nutritional aspects *before* large scale changes in diets are introduced.

The differences in food habits of different countries have been well demonstrated by the work of Robert Harris and his colleagues (of the Massachusetts Institute of Technology), who have examined the indigenous foods of Mexico and Central America.

Mexico

The work arose in 1947, out of an invitation to advise on a school lunch project in Mexico City; it was realised that a project based on current North American food practices would be relatively expensive and moreover that there could be no guarantee that the Mexican schoolboy would take kindly to an entirely new type of diet. Efforts were, therefore, made to devise meals based on typical Mexican foods, but a difficulty was at once apparent—little was known about the nutritive values of several of the common items, including the tortilla, the daily bread of the Mexicans.

It was decided, therefore, to collect and analyse typical indigenous food plants of Mexico and also typical prepared foods; the results have been given in a series of scientific reports,[54] which have been reviewed by the present writer.[48, 50]

It was demonstrated that many of the plants examined, including species and varieties unknown as food sources in the U.S.A. or Europe, contained high levels of certain nutrients, and especially of minerals and certain vitamins. Moreover in a number of instances a variety of a given plant in Mexico was higher in nutritive value than a corresponding variety in the U.S.A. The figures revealed also the differences that occur from one sample of a food plant to another, even in the same country, and illustrate the difficulties of using standard tables of food composition based on investigations of plants grown in temperate zones.[54]

The prepared foods examined included the tortilla—a flat cake of unleavened corn (*i.e.* maize) meal. Maize has often been condemned on nutritional grounds in view of evidence that maize diets are associated with deficiency diseases such as rickets and pellagra.[13, 35] However, it was found that the Mexican Indian from pre-Columbus days has prepared his tortilla by a relatively complicated process, first soaking the grain in *lime*-water, before grinding and baking.

The origin of the custom is unknown, but the effects are evident although not yet fully explained—the maize absorbs calcium and iron from the lime-water; the tortilla is thus fortified by these two mineral elements and the danger of mineral deficiency diseases minimised; at the same time other changes take place so that the danger of pellagra is decreased.[53, 56, 61]

Evidence was obtained that many groups in Mexico achieved a relatively high nutritional status by making full use of a variety of local plants and food preparations. In some Indian communities a by no means negligible contribution was made by the indigenous alcoholic beverage—*pulque*—which is now known to be an excellent source of certain nutrients.[54]

Central and S. America

The investigations have been extended from Mexico to the countries of Central and South America and have already had far-reaching consequences, leading to the establishment of food analysis laboratories at the National Institute of Nutrition in Mexico City, and to the foundation of an "Institute of Nutrition of Central America and Panama"—an experiment in international co-operation of prime importance, in that the central laboratories opened in Guatemala City in 1949 serve all the countries of the region.

The Massachusetts workers do not suggest that no improvements in the diet are necessary in Mexico and Central America, but they believe that in spite of the absence or scarcity of typical European foods such as meat, milk and fruit juices, the diets in many areas are fairly well balanced, even though the actual amount of foods available may be inadequate.

These surveys of diets (and allied surveys of nutritional status) point to the conclusion that the countries concerned should be able to raise nutritional standards and to promote a positive health policy on the basis of improvements in agriculture leading to a greater

In conjunction with UNESCO and with the help of F.A.O. the government of Mexico has sponsored a fundamental education centre at Patzouaro which aims at teaching villagers how they can improve their living standards by their own efforts and by using local material and facilities. Workers from nearly every Latin-American country are being trained at the centre; the immediate beneficiaries of the scheme are the villagers in the Patzouaro district, but as trainees return home, rural populations all over Latin-America will benefit. Reclaimed lands on the shores of Lake Patzouaro are excellent but need irrigation; here is a field of lettuce grown by a farmer formerly a fisherman.

production of crops of special value. The work indicates the importance of *dietary patterns* which vary from one country to another, and indeed from one area to another in one country. These patterns are undoubtedly the result of age-old experience and accumulated wisdom, and any drastic or sudden changes may well lead to widespread malnutrition. Modifications have taken place and perhaps should take place, but any recommendations for changes should be made only with full appreciation of the immediate effects and later consequences.[48]

Africa and Asia

The activities of the Massachusetts group were extended to China at a stage in the last war when it seemed likely that American troops would be stationed in China and would require food grown on Chinese soil. Harris was able to demonstrate the high nutritive value of many plants and food preparations.[54] The nutritional importance of the soya bean, a staple of the Orient, is well known; it has in the past half-century been successfully introduced into Europe and the U.S.A.

A number of food and nutritional surveys were undertaken prior to 1939 in overseas territories,[6, 11, 21, 26, 42, 47] but few of the investigations were in any way complete, and it is now clear that the importance of indigenous, especially the non-staple[26, 66] foods was often overlooked.

Findings have been reported not dissimilar to those in Mexico. Thus one medical officer with prolonged experience in Africa has affirmed: "It is not enough to deal only with the main staples and one or two other constituents of the diet. Results are likely to be erroneous unless investigators have an intimate acquaintance with the native and his daily life. Account must be taken of the occasional snack of dried oily fish . . . the fried grasshopper, and raw sugar cane, the assortment of green leaves which the women know so well how to select and cook, and last but not least, the mug of native beer."[66]

Testimony in favour of the importance of local foods has been provided by medical officers who were in prisoner-of-war camps in Asia; they have pointed out the deficiencies in our knowledge of those edible plants which grow so easily in tropical countries and which were cultivated in the prison camps and saved so many lives.[27]

The newer outlook may be seen in different reports and publications of international groups such as the World Health Organisation and the Food and Agricultural Organisation,[34, 36] and in publications from the United Kingdom,[13, 28, 55] and notably those of Platt's group from the London School of Hygiene and Tropical Medicine and the Human Nutrition Unit of the Medical Research Council.[40, 41, 62, 64, 65]

Recent work in South Africa

A thesis of great value has recently (1959) been published by the University of Witwatersrand Press, Johannesburg; this is a record of the investigations undertaken by P. J. Quin on the "Foods and Feeding Habits of the Pedi" (one of the Bantu tribes), and gives a systematic survey of the pattern of agriculture of the Pedi and of the types of cultivated crops and wild plants and fruits consumed.[16]

The author provides also an account of the fauna of the region and of the many varieties of animal foods eaten, including insects of different types such as caterpillars, beetles, locusts and ants. On the basis of his own experience and supported by many references to "unusual foods" in different regions of the world, Quin notes that "the ancient and universal habit of entomophagy provokes the interest of the average European, but it is generally viewed with disgust. The fact, however, remains that insects have played, and still do play, a vital part in the diet of many peoples; and the common prejudice against eating them is merely a matter of convention."

The author's conclusions are very similar to those drawn by the workers in Mexico: (i) that the "minor" foods may be of great significance in nutrition, especially as supplements to the staples, and (ii) that the recognition and encouragement of traditional food and feeding habits is all important. This South African report, limited as it is to a relatively small region, demonstrates that surveys of food and nutritional problems require a co-operative effort of

workers in many different academic disciplines and with different types of experience (anthropology and the social sciences as well as clinical medicine, biochemistry and dietetics).

Australasia

Information about indigenous foods in Australian protectorates and other territories is now available in governmental reports and other publications.[43, 44]

Indigenous alcoholic beverages

Reference has already been made to the Mexican *pulque*.[50] There is no better example of man's ingenuity in search of nutrients than the skill which has been shown in every region of the globe to turn the products of the soil to alcoholic beverages. The increasing literature on this topic provides abundant evidence to show that quite apart from special products such as food yeast[39, 67] many of the indigenous preparations are important sources of nutrients (including B vitamins and amino acids) arising in part from the fermentation process and in part from the yeasts normally present. It is only in recent times that the nutritional rôle of these products (when used in moderation) has been recognised. A report from Mexico states that at one time an effort was made to prohibit the use of *pulque* in a limited area;[50] the ban had to be removed because of the illnesses that resulted in the communities concerned. Quin quotes similar reports regarding Kaffir beer.[16]

CONCLUSIONS

In this review attention has been drawn to some of the investigations over the past twenty years which are of particular importance in the consideration of international aspects of foods and nutrition. These studies lead to the beliefs: (i) that diets must not be considered solely in terms of the staples and other foods common and popular in Western countries; (ii) that in all areas of the world indigenous foods deserve full investigation in that they may be quite as good as "Western" foodstuffs; (iii) that food processing techniques may produce changes in nutritional value (either for the worse, as in polished rice, or for the better, as with the tortilla); (iv) that there is need for intensive and extensive research on foods and feeding habits in many areas of the world; (v) that such research programmes cannot be fully successful unless they are co-operative efforts in which advice is sought from people with experience in different fields, ranging from anthropology, through agriculture to practical dietetics.

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Foam-Mat Drying is Better, say U.S. Research Workers

A NEW process, known as "foam-mat" drying, has been developed by technologists of the Agricultural Research Service of the U.S. Department of Agriculture, and is claimed to convert certain foods into high-quality food powders that can easily be reconstituted even in cold water.

It involves whipping liquid food concentrates into a foam with the assistance of certain additives, spreading the foam on a belt or tray, and compressing and crushing it into powder. So far, powders of good colour and flavour have been made from the juices of tomatoes and fruit; from whole and non-fat milk; and from other liquid foods.

It is claimed that the fine structure of the foam remains stable even when the dried form is compressed into pellets, so that the powders can be readily reconstituted even with iced water. The foam-dried powders have the advantage of holding less moisture at a given relative humidity than spray dried foods, and are, therefore, said to be less liable to cake. According to the research workers, the amount of additive needed is about 1% of the dry solids in the concentrate being whipped. Close control of foam density is obtained by careful adjustment of the quantity of additive and the amount of whipping. Commercial applications are being developed.

(*Above*): **Tomato paste which has been dried after whipping, compressed to increase bulk density, and crumbled to a free-flowing powder.** (*Below*): **Continuous drying of foam to form a porous mat which readily discharges from a belt.**

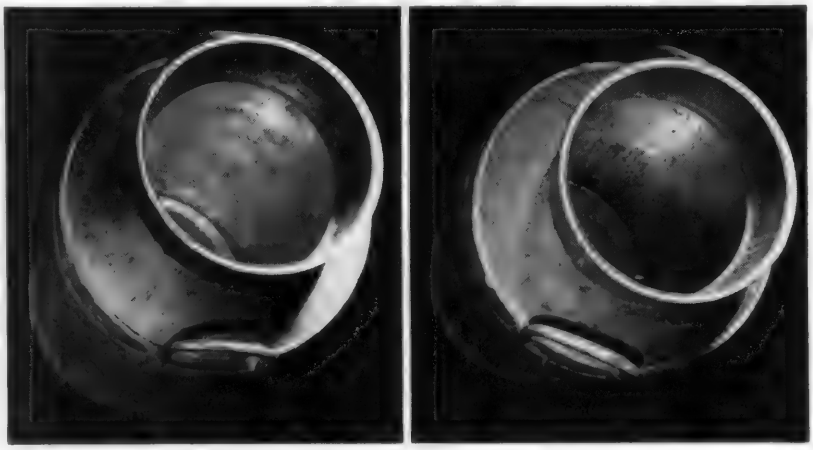
How Clean are your Containers?

Washing plant and solutions may harbour infection

By A. H. Walters,* F.I.M.L.T., M.R.S.H., M.I.Biol.

Most sanitation problems can be foreseen and prevented, provided their nature is clearly understood and routine preventive measures are taken. The food container is a most important item of equipment. General principles governing its cleaning and sterilising are given, together with several examples of unusual problems requiring expert advice. The simple key to any food hygiene problem usually lies in the answer to the perennial question: how clean is clean?

EVERYONE who works in the food industry naturally regards himself as knowledgeable on clean food production; any specialist, therefore, who is bold enough to write further on the subject might well lay himself open to the charge of unwonted rashness. The purpose of this article, however, is certainly not to tell the food industry how to keep itself clean but rather to discuss some instances when it has not been clean enough or perhaps clean in the right sense and places. In other words, to view environmental sanitation as a total rather than a specific concept.



(*Left*): **Milk churn showing milkstone.** (*Right*): **Churn showing corrosion.** (*By courtesy of United Dairies, Ltd.*)

How clean is clean?

In North America it is now generally recognised that the maintenance of clean food production is a function of environmental sanitation. This phraseology may fall strangely upon British ears but it really means what it says, namely, that the principal factors in maintaining clean food production are a satisfactory primary product, clean premises and plant, clean handling, and packaging, efficient processing, storage and transportation.

What precisely is meant by the word "clean" is sometimes open to differences of opinion, but from the bacteriologist's point of view, there is only one possible interpretation, namely routine *cleanliness to the point of excluding, as far as possible, any potentially pathogenic or spoilage micro-organisms.* This, in effect, usually means that the total bacterial count is controlled at as many points as possible.

The nature of the original foodstuff, the factory building, plant layout and design, handling methods, human efficiency, and cleaning and sterilising methods all play a part. In the large factory adequate provision is often made at the outset to arrange matters so that environmental sanitation is adequately catered for, but, even so, the concepts of the architect, builder, engineer and others concerned, may not cater fully for all microbiological contingencies and particularly for unusual microbiological emergencies.

This also may apply equally to the small factory, but here owing to expansion or varying demands made from time to time on the space available, conditions may arise which can seriously multiply the difficulties of maintaining a continually high standard of environmental sanitation. Problems may crop up in the most unexpected places, sometimes causing considerable financial loss or trouble with the Public Health Authority. It is proposed here to give some examples showing how such problems might be approached, investigated, diagnosed and treated.

Bottles and cans

Certain types of contamination of bottled foodstuffs can arise from the bottle, and/or the solution in which this bottle is washed, and/or the bottle closures.

It is very rarely recognised by operatives that *a cleaning process*

* Chief Bacteriologist, Diversey-Deosan Research Laboratory.

might be a contaminating process. This applies particularly to bottle or can washing, whether by hand or machine. Indeed, often in technological classes it is taught that a combination of the action of caustic soda solution at the right temperature for the right time will produce a clean bottle. Theoretically this is correct, but, in fact, it may not, of course, be true.

In bottle and can washing machines one of the great natural enemies is scale formation, and it is fairly well known that scale will harbour spore bearing organisms, some of which may be of the spoilage type and extremely heat resistant. But what may not be so easily appreciated is that often when a washer is descaled trouble with bacteriologically unsatisfactory bottles or cans may not cease, or, may cease for a time and then return. Such trouble may often be resolved by the use of a suitable sequestering detergent, correct dosage, temperatures and immersion times, but in some cases even this may not solve the problem.

Under such circumstances the undesirable organisms can usually be isolated from water in the rinse tank, and when this happens suprachlorination by the addition of sodium hypochlorite by drip method is employed. Despite these measures the trouble may still not be resolved and it is in such an unusual microbiological emergency that specialist advice may be needed.

Methods of investigation

The usual method of investigation is to take a careful history of the case, noting time of onset of trouble, persistance, resistance to methods used and so on. Obviously for a diagnosis, the first fact to establish, if possible, is the source of the contamination, and secondly, the reason for its persistence. In my experience the source would appear to be limited to three factors: (1) water supply, (2) the bottles or cans themselves, (3) caustic soda solutions.[1]

1. The water supply

Mains water is usually considered to be bacteriologically satisfactory, but in cases of obscure contamination it should always be tested because there may be faults underground local to the factory. If the water supply is connected directly to machines, then samples from the rising main cock should be adequate to eliminate the possibility of any infection arising at source. If the mains water goes through one or more collection tanks, the primary sample can be taken at the first valve. The tanks should be inspected, with the aid of a strong light, for foreign bodies, deposits and corrosion. Water samples should be taken from the tanks after stirring with a sterile dipper or by sterile immersion bottle. The route of the pipes leading to any particular machines should be traced, if possible, and if at any point a subsidiary tank of some kind, pump, water softener or some other apparatus is inserted in the line, then water samples should be taken as near as possible, before and after it enters such pieces of equipment.

I have seen three cases where old water softeners had become bacterial traps, particularly for spore bearers. Cultures made from mains water samples before and after passing the softeners revealed this contamination which was being steadily passed on to the washing machines and infecting them.

These comments are by no means aimed against the use of water softeners but rather to draw attention to the importance of examining water supply at various points before it enters the washing machine.

2. The bottles

Particularly where bottles are re-used and care is not taken routinely to reject obviously grossly dirty bottles or cans containing stale residues, heat resistant organisms can be steadily introduced into the washing machines. Such bottles should be prewashed by hand, if possible. Another source of spore bearing organism contamination that may be overlooked is in straw and other packing materials. It is always worthy of consideration in difficult cases both to examine bacteriologically the packing materials surrounding glass bottles, and if such packings are heavily infected they can be considerable dust-making agents and contaminate the air in the factory, thus causing a bottle infection hazard.

So often foodstuffs are packed in bottles or cans coming wet direct from the washer. How clean such a bottle might be when dry may be open to question. It depends on the nature and state of the original soiling, the interior surface and the efficiency of subsequent cleaning and rinsing. Adherent matter usually on the inside of the bottle frequently dries out, giving a streaky appearance, but this is often concealed by the nature of the foodstuff subsequently introduced into the bottle. This applies mainly to bottles which are re-used but it may occasionally occur with the one-use bottle for jams, pickles, ketchups, processed meats and fish and so on. The same often applies to metal containers of one kind and another and also pipelines. The interior of a stainless steel pipeline will frequently glint as clean as a gun barrel when it is wet, but if examined again when dry, especially with the aid of a pinhead bulb introduced down into the lumen, considerable adherent deposits may be revealed. A good light is essential when making such examinations, it often assists in deciding the best sites for taking bacteriological samples, or swabs or rinses.

3. The caustic soda solution

The fact that caustic soda solutions used as detergents can be a source of contamination was noted, in the writer's laboratory, at least, by pure accident. A farmer was using a 2·5% caustic soda solution for immersion cleaning of his milking rubbers, and his milk samples were steadily reported as containing a high number of milk souring organisms. The ordinary checks on this cleaning routine were made but the trouble soon reappeared. Eventually a very thorough bacteriological check was made by swabs

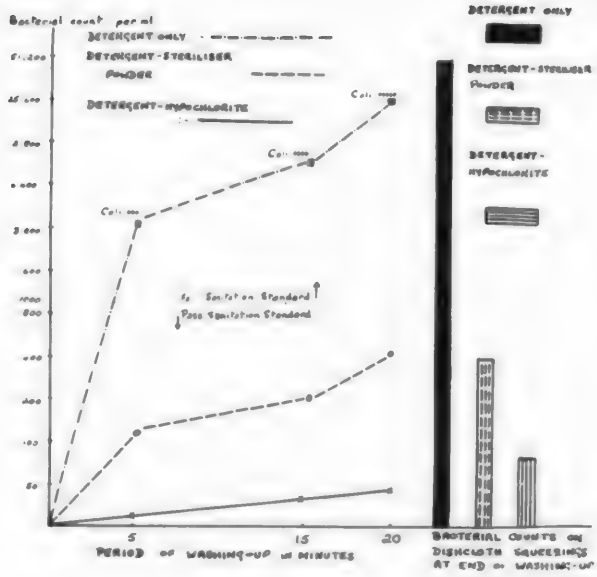
and rinses, samples being virtually taken of everything, including the caustic soda solution.

Back in our laboratory the normal cultures were made and the caustic soda solution specimens were planted up in the usual way, and also for experimental purposes, some of the caustic soda was neutralised with HCl to *p*H 7·0 before culturing. After 72 hours' incubation at 37°C. the normal unneutralised caustic soda solution returned sterile cultures but the neutralised sample gave counts of spore bearing organisms up to 6,500 per ml.

We found, on enquiry, that other workers had stumbled on this fact, namely that under certain circumstances caustic soda solutions can harbour such contaminants. The causticity kills off the vegetative forms of bacteria but the spores may remain, usually undetected. As these organisms build up in the caustic soda detergent tank they are incorporated into scale on chains and so on, and are carried into the rinse tank where, under certain circumstances, it is possible for them to multiply. Some mould spores, too, have this facility, and these, together with yeasts and achromobacter, can cause great trouble, particularly in the soft drinks and sterilised milk industry.

The use of Ringer rinses examined by selective count methods (total, coliforms, and S.S.O.—specific spoilage organisms) for estimating the bacteriological cleanliness of washed bottles and cans appear to be increasing. One reason for this is that visual cleanliness is recognised as being an insufficient standard, particularly where spore bearing organisms are concerned. Unlike coli or most other vegetative bacteria the initial inoculum of these organisms, as shown by Donovan, is far lower than normally reckoned enough to cause trouble and their potential heat resistance can pose very difficult problems.

We have found it undoubtedly true that detergent methods designed specifically for certain machines, taking into consideration type of surface, soil, water hardness and so on, can contribute considerably to preventing such problems by keeping machines and surfaces clean and free of scale. These methods become even more useful when automatic dosage devices can be fitted and regular technical servicing instituted.



Control of bacterial build-up in sink wash waters and on dishcloths (detergent-steriliser used).

Closures

Bottle closures used in the brewery and soft drinks industry can cause infection of the product. Most producers are now well aware of this fact and take the necessary precautions to avoid trouble from this source. One odd case in connection has come to my notice. It occurred in a fairly small but very old established soft drinks factory, where some of the machinery, still in excellent working order, was a century old. The closures were rubber ringed and in the recent past some infection had been traced to them, and the Public Health Authority advised the use of a suitable chemical sterilising agent in the rinse tank. The proprietor elected to use a quarternary ammonium compound and the trouble very soon increased. On investigation it was found that the particular Q.A.C., chosen and used in the dilution recommended, was quite ineffective against the infecting micro-organism. This result annoyed the proprietor, who pointed out that he had faithfully followed the directions. So he had, except in one particular, namely he used water in a tank at room temperature while the directions advised "warm or hot water." The antibacterial activity of most Q.A.C.'s generally increases enormously when the use temperature reaches about body heat and above. Once this fact was appreciated and the hot tap was used instead of the cold the trouble disappeared.

Churns and cans

From the purely bacteriological point of view experience of checking methods of milk production on farms from which creameries have rejected milk, or the authorities have suspended a licence, had led me to the conclusion that something of the order of one-third of rejected milk samples would not have failed statutory tests had the churns been in a satisfactory condition. This, of course, is a direct reflection on the efficiency of milk can cleaning and sterilising. In some creameries the cans are always thoroughly washed, steam heated to sterilise and returned to the farm dry. But this is by no means always the case and it is common knowledge that on hundreds of farms in the United Kingdom wet bacteriologically unfit churns daily carry the nation's milk.

But curiously enough, events have now gone full cycle, because

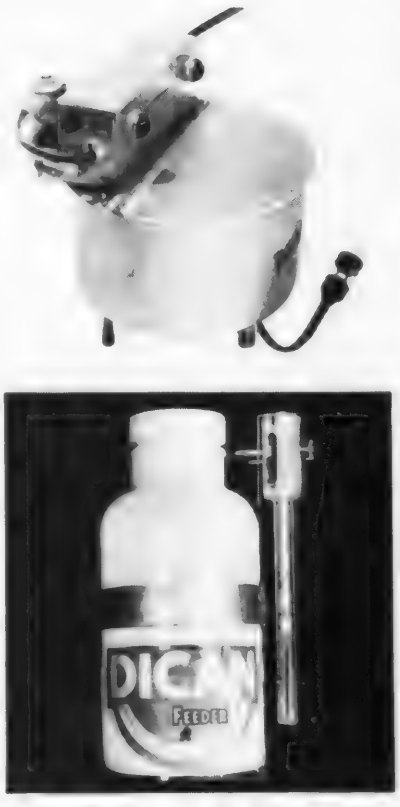
some creameries are being plagued by "bitty cream" in their pasteurised milk. This fault is extremely difficult to control and is caused by the heat resistant spore bearing organism, *B. cereus*. Donovan[2] (1959) of the School of Agriculture in Edinburgh showed how this organism tended to occur in milk received from particular farms and creameries. It was found that this contamination was "chiefly derived from cans, which, after being emptied of milk, had been allowed to stand for a long time before being washed properly and 'sterilised'."

Many times in our own laboratory we have been able to demonstrate this organism in scale from churns and also in detergent tanks and rinse tanks in churn washers. Thus the chances are that a creamery which neglects the physical conditions and efficient cleaning and sterilising of its churns may eventually build up a spoilage organism in the churn which will be passed to the milk and handed back to them to cause post pasteurisation trouble in their bottled milk, despite heat treatment.

Cleaning as an infection process

Hoy[3] (1955) of the Natural Institute for Research in Dairying, pointed out that the actual physical condition of the churns was most important and also "the regular use of methods for the prevention and removal of film (scale) and for the prevention of corrosion." This, of course, is axiomatic for all sections of the food industry, whether referring to plant, equipment or carrying vessels. Once again it underlines the paramount importance of having the correct detergent, together with a suitable scale removal routine (if necessary) adequately serviced technically to ensure the necessary safeguard against film, physical deterioration and the concomitant obstinate resistant infections.

Any really adequate cleaning and sterilising routine must minimise corrosion, pitting, rusting of the usual metal containers and etching and oxidising of the alloys of aluminium.



Automatic dispensers for dosing washing machines with cleaning materials. (*Top*): For liquids. (*Bottom*): For powders.

Near the beginning of this article it was stated that "it is very rarely recognised by operatives that a cleaning process might be a contaminating process." Examples of this in connection with washing machines have already been given and the same applies to hand cleaning using static water. It is not often realised that when cleaning a bench or machine or utensil the essential process is to remove, by means of a brush or cloth, the soil from its original site and transfer it into the water in the trough, pail, sink or other container which might be used. Obviously such a process also involves the regular transfer of bacterial infection into the static water, so that the dirtier it becomes the more infected it becomes also. The rate at which this occurs depends on the amount of static water, temperature, type and area of surface or surfaces being washed, the soiling, the duration of use of the static water and so on. All these factors were extensively investigated by Walters, Driver, Tiplady and Wilson (1955)[4] when they conducted an extensive bacteriological investigation of wash-waters and dishcloths used under practical conditions. As a result of this work these workers were able to show the completely haphazard approach to cleaning procedures from the point of view of selection of detergents and sterilisers and their dosage. They also were able to show the rate at which bacterial build-up could take place in wash-waters. The graph shows how, after five minutes, a given wash-water has become contaminated, after which time it will infect as it visually cleans. It also indicated a reasonable bacteriological standard which needs to be achieved in every hand washing process in a food factory processing or serving plant if contamination during washing is to be avoided. This means a total bacterial count of less than 1,000 organisms per ml. with coliforms absent in static wash water. Such a standard can be very easily achieved provided suitable chemical disinfection is included in the cleaning process, as shown in the graph.

Having such standards aids considerably any investigation in the food industry because even if someone has remembered to investigate the cleaning procedures as a possible link in the chain of infection, their results will be meaningless unless there is a clearly defined standard to which they can work.

The human hazard

But even where such methods are used the human hazard still continually operates. For hand washing the use of containers marked to indicate their gallonage capacity is advised, together with suitable plastic measures graduated to measure the requisite amounts of detergent and steriliser, singly or combined in one product. This, combined with systematic bacteriological checking, can do much to minimise the infection hazard.

(Concluded on page 173)

AIDS TO HYGIENE

Detergents and sterilants ★ insecticides and fumigants ★ sanitising paints ★ hygienic floors

HYGIENE in the food factory is a subject of such vast proportions that in the space of a short article reviewing manufacturers' products, it is not possible to do more than skim the surface of the subject. Considerations of hygiene apply to every aspect of food manufacture, from the soap which the worker uses to wash his hands to the design and construction of the factory building itself.

While the scope of this article is wide—dealing in respective sections with detergents and sterilants for cleaning plant and equipment, pesticides and fumigants for eliminating food pests, sanitising paints for wall surfaces, and hygienic floors—references to actual products are brief. The object is to give manufacturers a lead so that they can make their own enquiries and pursue the subject further.

Detergents and sterilants

These are distinct classes of compounds and really merit separate treatment, but so many manufacturers make both, and the tendency is increasingly to combine the qualities of both in one compound, that it is convenient to deal with them together.

The object of a detergent is to act as a surface-active agent to weaken the bonds which cause soil to adhere and to facilitate its being flushed away. As the nature of these bonds varies with the type of soil and the material of the surface to which it adheres, there are different kinds of detergent—anionic, cationic, non-ionic and amphoteric—and it is necessary to choose the right one for the job. Detergent washing is usually followed by sterilising with a sterilising agent, particularly when in-place cleaning is carried out, and it must be remembered that some sterilants and detergents are incompatible; while every effort should be made to flush out completely all traces of detergent before the sterilant is introduced, there is less likelihood of trouble if detergent and sterilant are compatible.

Most manufacturers of such compounds recommend a particular combination of detergent and sterilant, and most are ready to give advice on specific problems. The British Hydrological Corporation, for example, have specialised for 30 years in the manufacture of such agents, ranging from the mildest type of alkali cleaner to the most powerful sterilant. This company claims to have pioneered the commercial use of quaternary ammonium compounds as sterilising compounds in this country. They say that the most outstanding addition to the range of their products is the combined cleaning and sterilising agent known as B.H.C. 318, a powder material having the high degree of sterilising power claimed for the special quaternary ammonium compound also manufactured by this company. The product can be used either hot or cold and long periods of contact are claimed not to harm any known plant surface.

The company maintains fully equipped bacteriological, chemical and research laboratories where problems and new applications are investigated and whose work is entirely devoted to the sterilising and cleansing requirements of the food industry. Its staff of representatives can give on-the-spot service and its overseas interests extend this service to many parts of the world.

The Dyestuffs Division of I.C.I. market a range of products, three of which are of particular interest in this context. They are *Lissapol N*, a non-ionic detergent, and *Vantoc AL* and *Vantoc CL*, cationic bactericides, with which the first named detergent has the great advantage of being compatible.

The *Vantoc* range of quaternary ammonium bactericides are well-established products with several years' use in the food industry. They have a long hydrocarbon side-chain in their molecules (except *Vantoc CL*, which is an alkyl-dimethyl benzyl compound) and the resulting surface activity imparts penetrating and spreading powers which give them greater efficacy against deep-seated pockets of infection than chemical sterilants of the inorganic type. The oldest member of the range—*Vantoc B*—has been used, say the makers, for over 10 years. It was designed specifically for sterilising beverage glasses in retail establishments. *Vantoc A*, introduced about the same time, was designed for a similar purpose in manufacturing plants. Five years ago this product was replaced by *Vantoc AL* (alkyl trimethylammonium bromide), a clear mobile liquid to be used at dilutions varying between 1 in 300 and 1 in 1,300, according to the degree of contamination.

Vantoc N powder, introduced in 1954, has the storage advantages of a solid compound but can easily be dissolved to give solutions of working strength. The in-

troduction two years ago of *Vantoc CL*, which belongs to the alkyl dimethylbenzylammonium chloride class of compounds, marked an important advance. This group is one of the most bacteriologically active of the various groups of "quats," and the makers claim that dilutions of *Vantoc CL* (marketed as a slightly viscous aequeous solution containing 50% by weight of bactericide) in the range 1:2,500 to 1:5,000 will destroy a wide range of bacteria and yeasts after only short periods of contact. It is also less affected by hard water and the presence of organic matter than many other "quats."

For simple cleaning of small items of equipment the makers supply *Vantropol BQ*.

Reddish Detergents, Ltd., have developed two new products for general cleaning in the food field, *Cheshire Detergent Steriliser* and *Super Kinray Plus*. Both combine cleaning and sterilising in one treatment. They are claimed to be harmless to handle and free from corrosive action. The former is a neutral powder soluble in water, and contains a stable form of chlorine so that a solution containing 4 oz. in 10 gal. gives 250 p.p.m. of available chlorine. Solutions are generally used at a temperature of 115-130°F., but as good if not better results are obtained at higher temperatures.

The second compound is a non-caustic alkaline powder which can be used, say the makers, safely on all materials, including aluminium. It also contains a source of available chlorine so that a solution of 1 lb. in 10 gal. sterilises effectively. The firm also specialises in the manufacture of detergents for in-place cleaning.

Glovers (Chemicals), Ltd., offer a wide range of surface active agents; among their range of "quats," two are of interest to the food manufacturer. These are *Morpan CHSA* and *Morpan BB*, the former a white free-flowing powder and the latter a pale golden liquid. They are effective over a very wide *p*H range at concentrations between 1 in 1,500 and 1 in 10,000, depending on the natural resistance of the organisms.

Non-ionic detergents are compatible with "quats" and this firm manufacture two for this purpose, *Miravon F* and *Texofor F10*, the former a diluted product ready for use and the latter a 100% material. Sterilising detergents can be made from 1 part of "quat" to 2 parts of detergent, and the firm recommend 1 fl. oz. of *Morpan BB* and 3 fl. oz. of *Miravon F* to 32 gal. of water for such purposes as washing tanks, pipelines, buckets, walls and floors, etc.

Diversey (U.K.), Ltd., through their distributors, Deosan, Ltd., offer a range of chemicals for a variety of uses: *Divoluxe* for manual cleaning of holding tanks, etc.; *Divobrite* for bottle-washing machines; *Pyron* and *Dican XX* which are combined in the firm's "5-2" churn and can washing system; *Tembrite* for in-place cleaning of H.T.S.T. equipment; *Dilac* for controlling milkstone in milk and cheese plants; *Kontrex* for cleaning bake-tins; *Perfon* for copper, stainless steel, tile and porcelain surfaces; *Dicolube SL*, a lubricant for conveyor lines which has an added bacteriostat; *Everite*, a de-scaler for vats and brew kettles; and *Yellow Label Hypochlorite*, a general sterilising agent.

Sipon Products, Ltd., offer two compounds, *Mergital OP*, a non-ionic detergent of the alkyl phenol ethoxylate type, and *Bacfor AD*, an 80% solution of cetyl dimethyl benzyl ammonium bromide. For sanitising storage premises, the makers recommend washing with a 0·1% solution of the former containing 4 oz./gal. of washing soda, followed by spraying with a 1% solution of the latter; for cases, bins and baskets, they recommend washing with a 1% solution of the detergent followed by immersion in a 0·5% solution of the germicide.

Insecticides and fumigants

Insect pests in stored foods are not merely contaminants, they destroy annually quantities of food many millions of £ in value. Among the well-tried insecticides used to counteract their depredations, African pyrethrum is among the most effective.

The basis of the *Pybuthrin* range of insecticides manufactured by Cooper, McDougall and Robertson, Ltd., is African pyrethrum synergised with piperonyl butoxide. Different formulations are available for different circumstances. For space or surface spraying, *Pybuthrin* Insecticide No. 44 destroys flour moths, dried fruit moths, and their larvæ, say the makers, as well as various beetles and other pests. The compound is carried in an odourless and tasteless heavy oil base, and is non-toxic and non-tainting.

Other compounds are Insecticide No. 33, in a light oil base which disappears quickly, for granaries, bakeries, kitchens, etc.; Insect Powder, which is a powder preparation for kitchens, canteens and other places where food is handled or stored; and Bacon Protectant, of special interest to bacon curers, grocers, etc., which is a large-particle powder in pea flour for dusting on smoked bacon and ham to prevent losses from flystrike. A special Green Bacon Protectant is also available; both products destroy bluebottles and other flies which may alight on treated food. The product is non-poisonous and non-tainting, say the makers, when used according to the directions. The manufacturers offer equipment to ensure the most effective application of their compounds.

Methyl bromide fumigant will kill virtually all pests such as weevils, moths and mealworm at any stage in the life cycle, and also rats and mice. It is, therefore, used to fumigate flour, cocoa, cheese, sugar and many other foods, and the usual rate of application is 1-2 lb. per 1,000 cu. ft. Because of its powerful penetrating power and toxicity, fumigation must be carried out under gas-proof sheets or in a gas-proof room, using protective clothing to handle it. In spite of its effect on animal life, it is a safe fumigant to use with food; since it is only slightly water-soluble, it is not easily absorbed, and because of its high volatility goods can be aerated rapidly after fumigation. May and

(*Concluded on page 174*)

A general view of the Redpath refinery of Canada and Dominion Sugar Co., Ltd., which is situated on the Toronto waterfront.

Canada's New Sugar Refinery

Plant is Seaway's first contingent industry in Toronto

Built to take advantage of the St. Lawrence Seaway, Canada and Dominion's new $13 million sugar refinery incorporates the latest refining techniques.

CLAIMED to be the first major industry to be established in Toronto, Ontario, Canada, based on the transportation advantages to be derived from the St. Lawrence Seaway, a new $13,000,000 sugar refinery has recently been placed in production on the city's waterfront by the Canada and Dominion Sugar Co., Ltd. It is also Ontario's first complete refinery, Canada's fourth operating cane-sugar refinery (as distinct from sugar beet processing plants) and, as far as is known, the first complete sugar refinery built in the world in the past quarter century. It is intended to meet the ever-growing demands of the expanding population in the Toronto-Hamilton-Niagara district of Canada and to give a better service to industrial and household consumers.

Canada and Dominion Sugar Co., Ltd., was formed in 1930 as a result of a merger between the Dominion Sugar Co., which operated beet sugar factories at Chatham and Wallaceburg, Ontario, and the John Redpath Co., which operated a cane sugar refinery on the Lachine Canal, Montreal. In the centennial year 1954, the Redpath Montreal refinery was producing 2,500,000 lb. of sugar a day in many forms.

In 1951, however, when the Seaway was still a contentious international dream project, W. J. McGregor, the company's president, selected the site on which the new refinery stands. With the conviction that the Seaway would become a reality and foreseeing an era of continual growth and great industrial expansion for the Toronto-Hamilton-Niagara Falls area, wherein lies 44% of Canada's buying power, plans were formulated for erecting the refinery. Construction began in the spring of 1957 and production started on May 21, 1959, Her Majesty Queen Elizabeth and His Royal Highness the Duke of Edinburgh were the first official visitors to the refinery.

Today, deep sea vessels from the tropical ports of two hemispheres unload their cargoes of raw sugar at the new Toronto Redpath refinery. By way of the Seaway it is shipped direct from the West Indies, Australia and Mauritius without prohibitively expensive transhipment at Montreal. In 1958, Canada and Dominion imported $14,000,000 worth of raw sugar from the British West Indies for its Montreal refinery, and the placing into production of the new

(Left): **The Sweetland filters which remove the precipitated calcium carbonate formed after addition of lime and CO_2 to the liquor in the saturator tanks.** *(Right)*: **These centrifugals charged with massecuite from the vacuum pans spin at 1,200 r.p.m. to produce and take back a 5 in. layer of sugar crystals.** *(Below)*: **A flow diagram of the plant.**

Toronto plant, with a capacity of 1,300,000 lb. of granulated white sugar a day, will help further to strengthen the trading relations between Canada and other members of the Commonwealth family.

Large-scale automation

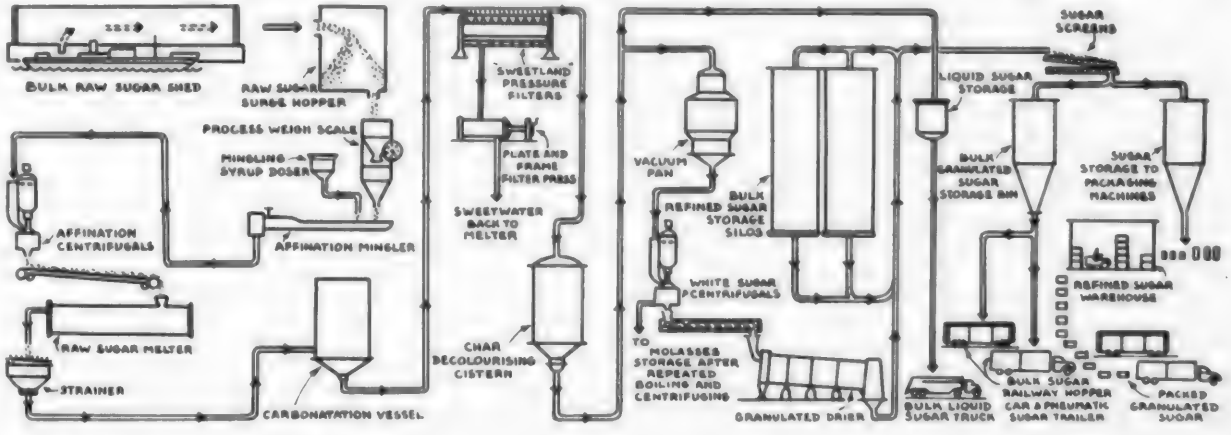
Contained on a 10·5 acre site, the plant buildings have a floor area of 310,000 sq. ft. and the plant itself incorporates an estimated 35 miles of installed piping, ranging from large-scale conduits to wire-thin copper tubes. The plant generates most of its own power. The major buildings in the group, connected by aluminium-clad conveyor bridges, include a 135 ft. high main process building, a raw sugar shed, packaging and refined sugar storage buildings and twin silos 148 ft. high each accommodating 10,000,000 lb. of refined bulk sugar. The entire plant is highly automated, with numerous control stations. At no stage in the processing is the sugar touched by human hands.

Special bulk sugar unloading cranes at the wharf are able to discharge two hatches of an ocean-going vessel simultaneously, at a combined rate of over 400 tons hr.

Raw sugar handling

Raw sugar is taken from the Colby level boom cranes by conveyor belts to a weigh station at the south-east corner of the bulk raw sugar shed, which has an overall length of 509 ft., an overall width of 140 ft., and a capacity of 80,000 short tons. At the weigh station, two Toledo scales automatically weigh the raw sugar, and the weights recorded are used to calculate the payment weights and by the Customs for calculating the amount of duty. From the scales, the raw sugar is elevated up to and along the inside of the apex of the shed, where it is dropped off a shuttle belt at the required position so as to form a pile below. The pitch of the roof of the shed conforms to the unique angle of repose of the raw sugar. By so building around the pile of sugar, construction costs were kept down much below what they would have been had the building walls being stressed for lateral thrust, as is the case with grain elevators.

When required by the refinery, the raw sugar is drawn out from beneath the pile by conveyor belt below the floor, on to which it is pushed by a small bulldozer, and taken to the top of the process



(*Left*): **From the Sweetland filters the liquor is piped to the liquor gallery shown here, where it is checked for quality and colour, then pumped to the char house for colour removal. Pumped back to the gallery again, the decolorised liquor is re-checked for quality, then pumped to these vacuum pans** (*right*), **where the liquor is evaporated under reduced pressure until crystals of required size are formed.**

block by way of one of the aluminium-clad conveyor bridges.

Processing

In the processing building, the sugar flows by gravity and by pressure systems through the various processes. The initial treatments to which the raw sugar is subjected are affination and carbonatation to remove the molasses and other impurities. In 1,800 lb. batches, the sugar is dumped into the mingler, which mixes the sugar with affination syrup from an adjacent tank to form magma. The syrup dilutes the molasses film on the raw sugar crystals to permit removal of the film in subsequent processing.

From the mingler, the magma is discharged through heaters to a battery of automatic centrifugal machines below, which, revolving at 1,200 r.p.m., spin off the affination syrup. The sugar crystals remaining in the centrifugals are spray washed with pure water. Now a pale yellow colour, the mass is conveyed to the melter vat from which it emerges as a murky yellow liquor at a temperature of 150°F. following treatment with steam and hot water.

In the carbonatation saturator tanks the liquor is mixed with milk of lime and a precision-controlled chemical process forms chalk to trap impurities in the sugar liquor, the chalk being formed by piping carbon dioxide into the tanks and through the liquor and lime mixture.

To trap, in turn, the chalk so formed, the liquor is passed through Sweetland fabric pressure filters, from which, emerging straw-coloured, clear and brilliant, and free from the waxes, gums and other impurities from the stalk of the sugar cane, it is piped to the char house. In the mammoth charcoal-filled tanks in this section all the remaining impurities are adsorbed and the "fine liquor" is drawn off as a clear, colourless solution. This product is supplied to some industries as liquid sugar.

In the final stage of the refining process, the liquor is boiled in cylindrical vacuum pans for two hours at 170°F. until crystals of the required size are formed. At the Redpath Toronto refinery, the stainless steel vacuum pans are 25 ft. high and each turns out the equivalent of 60,000 lb. of refined white sugar in a mixture of massecuite sugar syrups. At the precise moment in the boiling process the strike of massecuite is "dropped" and drained into centrifugals in which the syrup is spun at 1,200 r.p.m. away from the sugar crystals, which are left in a 5 in. layer. The latter are then double washed, leaving pure refined white sugar. Each cycle produces about 850 lb. of sugar. The sequence of operations of the Toronto centrifugals is automatically controlled and requires only supervision. The 200 h.p. drive motors become generators to slow the machines down, saving on power and braking equipment.

Moist sugar from the centrifugals is conveyed to the granulators where all but 0·01 to 0·02% of moisture is removed. After screening for size and grade the sugar is ready for packaging or for delivery to the refined storage silos. The packaged refined sugar warehouse has a capacity of over 25,000,000 lb. of sugar.

Power requirements

The Redpath plant power house at Toronto contains the first Canadian-built land-based turbo-generator, and the control room has the largest air circuit breakers ever built in Canada. Both were made by C.G.E. at Peterboro. The seven-

The control room of the Toronto refinery.

stage turbine requires steam at 750°F. and 675 p.s.i. pressure at a rate of over 50,000 lb./hr. to power the 2,500 kW. generator. The exhaust steam, at 15-40 p.s.i. pressure is used entirely for process requirements. The turbine steam ratio to process steam requirements works out at about 50 to 65% depending on electrical load and steam load. While the thermal cost of operating turbo-generators is relatively low in B.T.U.'s per kWhr. and operating costs are also low because the turbo-generator can run without constant supervision, maintenance and depreciation of the unit contribute the highest cost factor. Such an installation does, however, also provide a private dependable power, since the refinery would otherwise be highly vulnerable to sudden un-scheduled interruptions in the outside power supply.

Provision for expansion

Approximately three-quarters of the refinery, including much equipment never before made in Canada, was engineered and fabricated by Canadian firms. The planning, designing and equipment installations were supervised by the company's own engineers, assisted by Tate and Lyle Technical Services, London, England. The general contractors for the equipment installation were Canadian Comstock Co., Ltd. With additional machinery, the present production of 1,300,000 lb. of white sugar per day can be trebled and provision has been made throughout the plant for this expansion.

Sir Ian D. Lyle and Mr. Peter Runge, of Tate and Lyle, Ltd., are on the Board of Directors of Canada and Dominion Sugar Co., Ltd., and while two-thirds of the company's 1,550,000 issued shares are held by Canadians, Tate and Lyle hold a considerable share interest of the balance and have recently made an offer for a greater proportion of the shares.

Begun by Canada and Dominion in 1955, when they also first opened a refined sugar warehouse on the Toronto waterfront site, the shipment of bulk raw sugar into Canada is relatively new. Over the next two years from 1955, over 80% of the company's raw sugar purchases were delivered in bulk. Incidentally, the Sugar Line, Ltd., a U.K. shipping group associated with Tate and Lyle, Ltd. has expanded its freight-carrying capacity in anticipation of a greater demand for bulk shipments from refiners all over the world.

—JOHN GRINDROD.

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Precooked Frozen Foods in America

PRECOOKED frozen foods are not a recent innovation, but it is only in the last decade that they have become such an important part of the diet of the U.S., as is shown by the fact that in 1955 more than 500 million lb. of these foods were consumed. Sales in the U.K. have not reached the same proportion, but it is almost certain that this industry will continue to grow as refrigerators become more and more a part of our way of life. Along with the rise in the part played by precooked frozen foods the freezing of baked goods has also developed, as this is stated to be the only method known at present of preventing the staling of such goods.

*The Freezing Preservation of Foods** in its early editions had only one chapter devoted to the subject which now commands the second volume of the third edition. The work covers the production, freezing, packaging and marketing of baked goods and precooked and prepared foods, including ice cream and other frozen desserts.

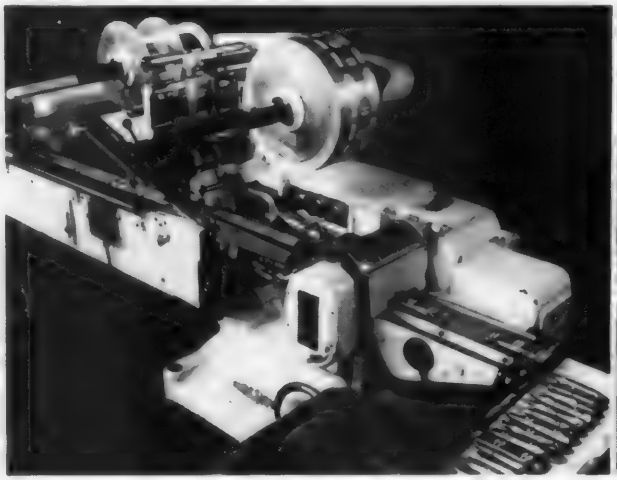
The problems arising from the preparation and freezing of precooked foods are so different from those of the procedure for raw or blanched materials that the authors have devoted a chapter to them. Another topic which has merited a chapter of its own is the packaging of baked goods and precooked foods, although the containers and the materials used for them are basically the same as those used for frozen raw foods. Altogether the work has 24 chapters and over a hundred illustrations.

* *The Freezing Preservation of Foods—II, Freezing of Precooked and Prepared Foods.* By D. K. Tressler and C. F. Evers. Avi Publishing Co., Inc., Westport, Conn. Pp. xiii and 559.

▶ British Cellophane, Ltd., have issued a booklet on their carton wrapping aid. The aid is described, together with its applications and method of use.

▶ The use of film packaging for meat and baked goods are the subjects of two booklets issued recently by British Sidac, Ltd. The choice of film for the various products and the method of wrapping are among the topics covered.

Machinery and Equipment



(*Left*): **The Forgrove 84 Flowpak wrapping machine, 4 versions of which are being exhibited at Interpack.** (*Right*): **An automatic sausage filling and linking machine, which fills, links and weighs each individual sausage at up to 200 per min., supplied by the Amasal Group.**

WRAPPING MACHINE

The general principle of the Forgrove 84 *Flowpak* is that any article which can be carried inside a tube of wrapping material by belts gripping the sides, or top or bottom, and providing the product is sufficiently rigid to be pushed by a chain lug, can be wrapped economically and efficiently.

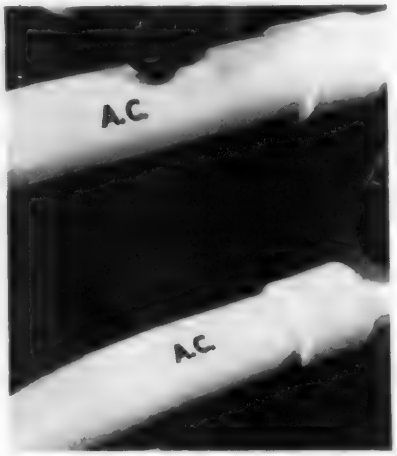
The articles are fed with their lengths in line with the direction of travel to a continuous chain conveyor infeed from which they are transferred into a tube of wrapping material. The longitudinal seam is normally of the fin seal type, thus the heaters do not come in close contact with the article itself. Before the wrap is completed, the fin is laid flat and held down by the end seal. The latter is made by crimping and heat sealing the wrapping material without gussets. The individual articles are separated by a knife, which cuts through the centre of the end seal.

Baker Perkins (Exports), Ltd., in association with their German sales company, Forgrove G.m.b.H., are exhibiting 4 versions of this machine at Interpack, Düsseldorf, this month, as well as many other machines from their range.

PIPELINE IDENTIFICATION

One of the many tedious jobs now simplified by a self-adhesive product is the identification of pipelines. *Sellotape* pipeline identification tape, made by Gordon and Gotch (Sellotape), Ltd., can be used in several ways.

One or more coloured "rings" applied at intervals along a pipeline run



"Sellotape" pipeline identification tape, printed with B.S. text symbols, in use on pipeline installations at U.K.A.E.A., Harwell.

will give a simple colour coding system. Colours can be supplied to British Standard No. 1710:1951 recommendation, if required.

More detailed information as to contents, direction of flow, etc., can be imparted if the "rings" are printed with an abbreviated letter code and/or British Standard's symbol. Alternatively, the name of contents printed in full—*e.g.*, air, vacuum, workswater, etc.—brings obvious advantages. Where pipes are already coloured, a white ring printed with black identification wording makes a distinctive readily seen label.

AUTOMATIC SAUSAGE FILLER AND LINKER

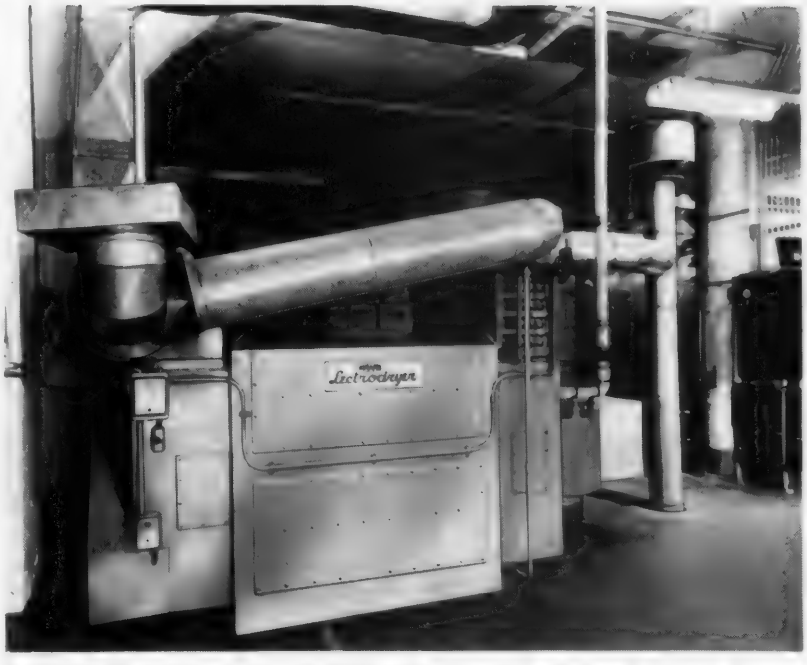
What is claimed to be the first fully automatic sausage filling and linking machine not only puts the sausage meat into the casing but also automatically fills, links and weighs each individual sausage at a rate up to 200 per minute.

This machine, supplied by the Amasal Group, is equipped with a regulating mechanism which can control the individual weight of each sausage; it is possible to make single sausages of $\frac{1}{2}$ lb. in weight or as many as 40 sausages to the lb. The weight and size of the sausage which is required having been set, the machine then carries on automatically producing the product. A uniform pack which is claimed to have great sales appeal is the final outcome.

DUST CONTROL

A further addition to the range of dust collection and control plant manufactured and marketed by W. C. Holmes and Co., Ltd., is the Holmes-Retroflux bag filter.

It is claimed to be particularly suitable for those applications where high dust burdens are encountered and/or dusts of an adhesive nature have to be collected. It is of advanced design and has an extremely efficient and continuous method of cleaning the filter bags which ensures that large volumes can be handled with constant pressure drop and high collection efficiency. An efficiency in excess of 99% for all particles, including those of sub-micron size, can be guaranteed, say the makers.



A G.W.B.-Lectrodryer, air conditioning type, installed in a confectionery factory.

In operation, the dust laden air enters the header within the casing and is distributed to the inside of the filter bags, the air and dust moving in the same direction. The tendency of the dust to settle by gravity is not impeded by air currents, as the air passes through the filter bags radially and the air velocity gradually diminishes to zero at their lowest end. The dust collected on the inner surface of the filter bags is continuously dislodged by the passage of high velocity air jets through the fabric in the reverse direction to the main air stream. The dislodged dust falls by gravity to the worm conveyor or hopper below. The use of high velocity air jets is a design feature of the Holmes-Retroflux bag filter which dispenses with the rapping or shaking mechanism and separate compartments encountered in other types of bag filters.

ELECTRIC DRYERS

G.W.B. Furnaces, Ltd., have commenced production of a complete range of electric drying equipment. Designed to maintain a constant low level of water vapour in air, gases or organic liquids, the product is being marketed under the name *G.W.B.-Lectrodryer*.

The basic element is an adsorber unit, containing a granular material, such as alumina, which adsorbs moisture from the air, gas or organic liquid passing through it. Subsequent heating restores the adsorbent to its original efficiency as a drying agent.

To maintain efficient moisture removal, units intended for continuous operation have twin adsorbers, alternately adsorbing and reactivating. The actual heating is carried out by embedded heating elements or by a stream of pre-heated air.

Single adsorber driers are suitable for intermittent operation, where drying is required only during the working day and reactivation can be effected at night.

A wide range of driers is available, from the 68 lb. model handling up to 20 cu. ft. of air per minute to large custom built models for special applications. Auxiliary equipment, including devices for measuring moisture content and filters to prevent contamination by oil vapours, are also available.

ADHESIVE TAPE

Adhesive-backed P.T.F.E. (polytetrafluoroethylene) tape is now available from the Fluorocarbons Department of A.E.I. Radio and Electronic Components Division. This concern claims to be the first in this country both to manufacture and market this product.

Bulk quantities of the tape can be supplied in sizes up to 2 in. in width and 0·015 in. in thickness, greater widths and thicknesses will be available in the near future.

It is claimed that the material has very useful adhesive properties when applied cold. In this case, the surface to which it is to be affixed is thoroughly cleaned. After the backing paper has been removed, the tape is pressed firmly into position.

The bond strength can be increased further if, after the tape has been applied as described, the assembly is heated to approximately 200°F. for 20 minutes. To obtain maximum bond strength an additional five minutes' heating at 300°F. is required. After this heating process, the material should be left to stand for 24 hours.

It is said that samples applied to shim steel by this method have shown peel strength of the order of 2 lb. per inch width, and sheer strength of between 12-20 lb. sq. in. The adhesive becomes thermoplastic at temperatures in excess of 150°C., but retains useful adhesive attributes up to 200°C. Resistance to acids and alkalis is good, but the adhesive is affected by most organic solvents.

COLOUR MATCHING UNIT

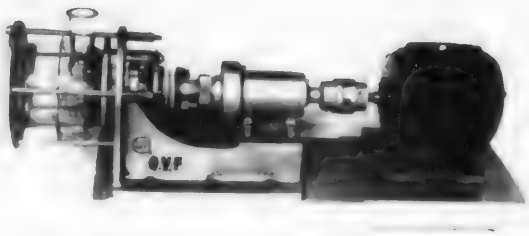
A redesigned Siemens Ediswan colour matching unit, based on the success achieved over the past years with the industrial unit, is produced by the Lamps and Lighting Department of A.E.I. Radio and Electronic Components Division. It will find applications where a light source accurately simulating north sky daylight is required.

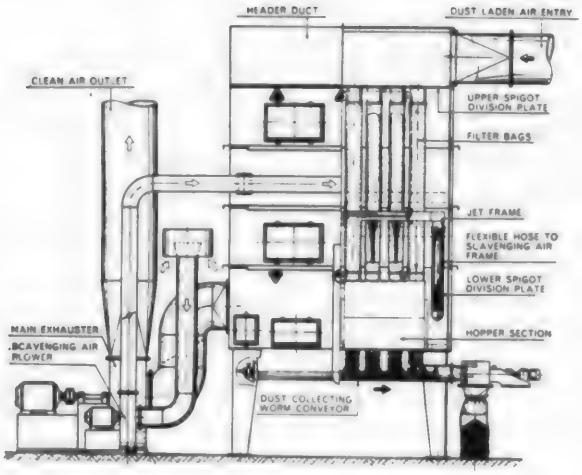
Colour matching unit F221/43 employs two 2 ft. 40 watt special blue fluorescent Sieray lamps and two 60 watt pearl single coil gasfilled filament lamps. Their output is blended and diffused within the unit to give a spectral quality claimed to be almost identical with that of natural daylight at a colour temperature of 6,500-7,000°K.

The diffusing window measures 23½ in. × 17 in., and is a large area source of low brightness which compares with a window illuminated by natural daylight.

The unit consumes about 220 watts and produces about 3,000 lumens. Samples can be examined under illumination intensities of between 45 lumens/sq. ft on a plane 3 ft. below the window, and 20 lumens/sq. ft. 5 ft. below.

The Siemens Ediswan colour matching unit type F221/43, produced by the Lamps and Lighting Division of A.E.I., is seen here mounted on a collapsible stand.





(*Above*): An all-glass pump for dealing with corrosive liquids recently introduced by Q.V.F., Ltd.

(*Right*): A drawing of a Homes-Retroflux bag filter.

ALL-GLASS PUMPS

Two all-glass pumps for dealing with corrosive liquids have recently been introduced by QFV, Ltd.

The impeller is of simple design based on a vortex-type inlet with specially designed arms. The mechanical seal is a glass-loaded *Fluon* bellows rotating on a glass plate, while a specially designed bearing chuck holds the precision-ground impeller shaft. The pumps, which are mounted on heavy cast-iron base plates, require priming.

Type GPA/6 will pump 10 gal./min. against a head of 24 ft., or 50 gal./min. against 13 ft.; for the type GPA/9, the rates are 20 gal./min. for a 45 ft. head and 100 gal./min. for 25 ft.

TEMPERATURE SENSING

Designed to detect and give audible or visible warning of temperature changes, the Kidde *Temp-O-Larm* is intended primarily for use with refrigeration equipment such as frozen food cabinets and cold storage vaults. It may also be used, according to the makers, for sensing high or low temperatures in any type of processing equipment, heating and ventilating plant, etc., where it is possible to fit a thermostat. It is claimed that the system takes up very little space, is easily installed, and needs little or no maintenance.

Basically, the system consists of a small temperature detector which is placed in each freezing cabinet or vault and connected by wires to an annunciator located where the warning can be most easily heard or seen. Each annunciator unit can be removed or installed by disconnecting the plugs and aligning the couplings. It is said that internal wiring or difficult connections do not hamper the fitting of these units. A rise in temperature above that at which the device is pre-set, sets off the alarm.

To compensate for the normal temperature increases which result from defrosting cycles or reloading a cabinet, there is an adjustable automatic control which can be set to delay the alarm for up to 6 hr. and thus prevent false alarms.

Two standard power supply units of 240 v. 50 cycles are available to power either one to 6 or 7 to 12 separate annunciator units; each of these units can be connected to one refrigerated space. It is also possible for one annunciator unit to be used for more than one refrigerated space provided that the temperatures of the various spaces are within a 10% relationship of one another and that the defrosting cycle takes place at the same time; thermostats must be wired in series.

In addition to detecting temperature changes, the unit can be used to give an indication of loss of refrigerant, faulty thermostats and expansion valves. If a complete power failure occurs, an instant warning is given.

SEALING CONVEYOR

A compression sealing conveyor which may be used to seal glued cartons is made by Metaducts, Ltd. The conveyor has individually spring-mounted compression rollers and there is single handwheel control to adjust the height of the upper compression boom.

The conveyor is powered by a ¾ h.p. 3-phase motor flange mounted to the gearbox, with a D.O.L. starter. Drive is by chain to the drive pulley.

The standard version of this machine is 15 ft. long and takes cartons up to 1 ft. 3 in. wide × 2 ft. high. The standard conveyor is 2 ft. above floor level.

ASH EXTRACTOR

The recently introduced Riley automatic ash extractor, made by Riley (I.C.) Products, Ltd., has been developed as a standard item for installation with most sizes of either new or existing Riley type T chain grate stokers.

The extractor is a conveyor type and is designed so that there is very limited wear on the moving parts since the ash is stationary on the apron plates and moves in relation to the conveyor. The conveyor travels at a constant speed of 3½ in. per min., and is driven by a separate gear assembly comprising an ¼ h.p. geared motor with a reduction of 1,440/0·96 r.p.m. and a further gear train with a 3 to 1 reduction, giving a front shaft speed of 0·32 r.p.m. A spring-loaded clutch with the driven half on a splined shaft protects the gear assembly from overload. Provision is made for tensioning the conveyor.

A steam cleaning assembly, which is operated for about 15 sec. per week and uses less than 1 lb. of steam in the process, is incorporated to remove any fine particles of ash which penetrate to the inside of the extractor. The ash box at the front of the stoker provides for an ash chute to a water trough conveyor, but it can be fitted with a draw-plate for discharging ash into a low trolley or pan with runners attached.

It is claimed that the advantage of an automatic ash extractor is that it eliminates the frequent opening of ash doors and thus prevents the ingress of air which cools the furnace gases and reduces efficiency. Forced draught fans do not have to be stopped while ashing is in progress, and there is a saving in labour.

Notes for Contributors and Authors

The Editor of FOOD MANUFACTURE welcomes articles, news items and other contributions on all aspects of food production.

The purpose of this journal is to exchange information between all those concerned in the food industry. Articles should therefore be written in a readable style, avoiding esoteric terminology and technical jargon, and should contain factual and practical information.

A preliminary synopsis should, preferably, be sent to the Editor, and the contribution itself should be typed in double spacing on one side of the paper only. It should bear the name and address of the author and should be accompanied by photographs suitable for illustrations.

News Digest

Biological Testing Station Proposal

Individual firms have been sent a circular letter setting out the proposals for establishing a biological testing station and asking for voluntary annual subscriptions. When replies have been received, the Food Testing Research Association, as the new association is being called, will know what amount of money is forthcoming and will be in a position to apply to the D.S.I.R. for an industrial research grant. Until the station has been established it is not possible to fix annual subscriptions, and for the first 5 years, therefore, these will be voluntary. It is hoped that members will subscribe between £100 and £1,000 per annum each according to their importance, and more if they feel able to do so.

In the early stages of the discussions, Professor H. J. Channon was commissioned to undertake the investigations into the possibility of establishing such a station, and his report was submitted in 1957. This report forms the basis of the present proposals.

It is estimated that minimum space required would be 5,000 sq. ft., and discussions are in progress with B.F.M.I.R.A. at Leatherhead regarding the renting of a suitable plot of land. Cost of erecting laboratories will be up to £35,000, and the equipping of them a further £40,000. Initial capital outlay will therefore be about £75,000. Running costs are expected to average £20,000 a year for the first few years, with actual expenditure rising from about £10,000 in the first year to about £35,000 in the fourth.

This assumes a staff build-up from an initial 12 to about 40 by the end of the fourth year.

The appointment of the director and his key staff will be the first essential. The organisation will be modelled on the pattern for an industrial research association laid down by D.S.I.R. The testing programme will be determined by the governing body, and is expected to include basic toxological research and some research into methods of testing and analysis, together with a limited amount of privately sponsored work for individual companies on payment of a fee.

Brewing, Bottling and Allied Trades Exhibition

One of Great Britain's oldest trade exhibitions, until now known as the Brewers' and Allied Traders' Exhibition, in future will be known as the Brewing, Bottling and Allied Trades' Exhibition. It will be held at Olympia, London, from October 3-7 this year, and every facet of the industry will be on view.

All the latest developments in plant and equipment will be displayed, together with such items as heat exchangers, pumps and beer storage tanks. A complete range of equipment for soft drinks industries will also be exhibited, together with the latest methods of storage and mechanical handling. Also this year the continental wine industry will be represented.

U.K. industrial development office opens in New York

In a written answer, Mr. Maudling, President of the Board of Trade, said that the time was ripe to set up an office in New York to provide a source of information about business opportunities in U.K. Hitherto, this information has been supplied by the commercial sections of the embassy and consular posts throughout the U.S.A. A senior official of the Board of Trade, Mr. A. Currall, will take charge of the new office, whose address will be: 99, Park Avenue, New York, 16.

Butter and carcase meat down in 1959

The February issue of the Commonwealth Economic Committee's *Intelligence Bulletin*, which reviews developments in United Kingdom supplies of dairy produce and meat in 1959, shows that a reduction in domestic production and imports brought supplies of butter and carcase meat below the 1958 level. The decline of 3% in United Kingdom milk production was accompanied by an increase in liquid consumption, and the amount available for manufacture fell by about 90 million gallons last year. Thus, domestic output of butter was reduced sharply, while imports, which had been at the highest post-war level in 1958, declined by 15%. With imports from Australia substantially higher and the arrival of an appreciable quantity from Canada towards the end of the year, Commonwealth countries provided 58% of the total butter imports of the United Kingdom compared with 52% in the previous year and under 50% before the war. The decline in supplies from home output and imports was reflected in a sharp reduction in stocks, which in November fell to their lowest level since early 1956, and a recovery in prices; subsequently stocks have risen while prices have been reduced. Although butter consumption per head fell to about 18½ lb. last year while that of margarine recovered, butter offtake remained some 3½ lb. above that for margarine. However, while the combined consumption of the two products was the same as pre-war, butter showed a decline of around 6 lb. Cheese production in the United Kingdom fell by 8% in 1959 but imports rose by 15%. Consumption is estimated to have fallen by ½ lb. compared with 1958 when heavy withdrawals were made from stocks, but it remained higher than before the war.

New Walls cold store

A new cold store recently completed for T. Wall and Sons (Ice Cream), Ltd., at their Acton, London, factory, measures 250 × 100 ft. and incorporates a number of features new to ice cream cold stores. Temperature in the store is −50°F., and to prevent the ground underneath from freezing the store is built on concrete stilts, which raise it 3 ft. off the ground and allow air to circulate underneath. Walls and ceiling of the store are insulated with 12 in. of cork.

During peak seasons, 60 men will be working at the store, 20 of them mostly inside. The store will be served by 45 vans, up to 5 of which can be loaded at once. The despatch bay, where loading goes on night and day, is soundproofed to avoid disturbing nearby residents. At peak periods, up to 12,000 galls. of ice cream can be loaded per hour.

New Lyons company

Following the successful test marketing of new confectionery lines in 1959, J. Lyons and Co., Ltd., have decided to set up a separate subsidiary company to exploit these products and also to take over the production of the existing range of their other confectionery lines as from April 1, 1960.

The name of the new company is Rolls Confectionery, Ltd.

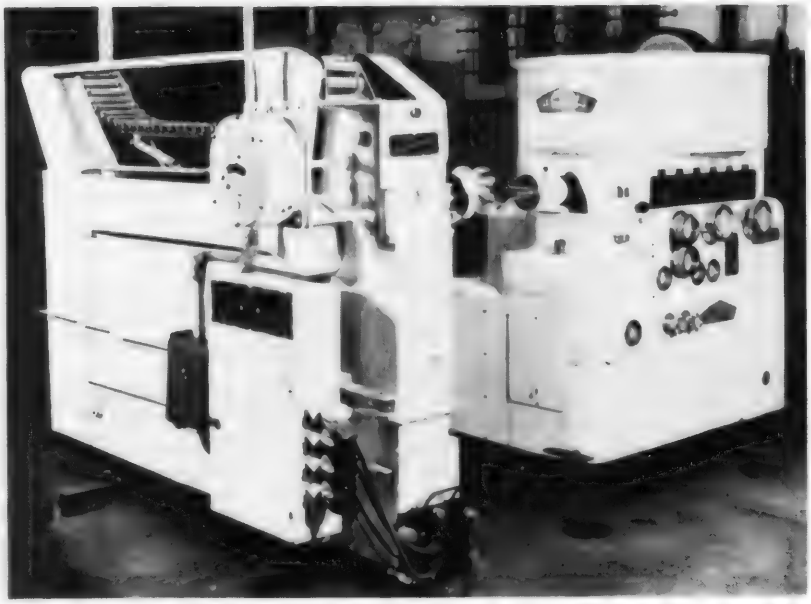
Chairman is Mr. N. L. Salmon; the managing director is Mr. G. K. Lawrence; Mr. S. R. Dorizzi is the marketing director; Mr. A. McIndoe the sales director; and Mr. N. Pringle the commercial director.

Foodtech's new machine

An invited party gathered recently at the Tottenham factory of H. A. West, Ltd., to see the first skinless-sausage machine, the Foodtech *Sausage Master*, in operation. This machine, looking surprisingly elegant and streamlined considering the number of separate processes it eliminates, has been developed by Mr. P. H. Hilgeland, managing director of Foodtech, Ltd., and is the culmination of twenty years of experiment. It deals with all the interim processes between the continuous feeding of the mixture into the hopper and the final emergence of the sausage, skinless, pre-cooked if required, and ready for packing or canning. During the processing all air is removed from the mixture, and this, it is claimed, will result in greatly improved keeping qualities in the sausages.

The *Sausage Master* was set into operation by Mr. Norman Dodds, Labour M.P. for Erith and Crayford, who expressed satisfaction at a development which made it possible for sausages to be manufactured without being handled at any stage in the process.

At a reception held afterwards at the Southgate home of Mr. Hilgeland, the products of the *Sausage Master* were subjected to the final test—that of being eaten—and were pronounced very satisfactory by all.



The Hilgeland Rohwer "Sausage Master" supplied by Foodtech, Ltd., is a fully automatic sausage machine which produces skinless sausages in various sizes; it can also produce edible casings, and can be used for producing a variety of sausage products in cellulose casings. Provision is made for frying within the machine.

Food in Parliament

A blissful future for the housewife when, thanks to dried food, "feather-like chops, steaks, fruit and vegetables" will be available in her larder, enabling her to prepare a substantial meal in about 10 min., was visualised by an M.P. in Parliament recently. He asked whether there was an indication that dried food would take the place of frozen food.

Mr. John Hare, Minister of Agriculture, Fisheries and Food, refused to go as far as this. But he told the M.P. who raised the question—Mr. Norman Dodds (Labour, Erith and Crayford)—that he believed there was a future for dried food.

The Government have, in fact, been encouraging these processes both by placing contracts for the manufacture of dried food and by conducting research and development work. Their hope is that the industry will follow up the promising new processes which have been demonstrated and which are being further improved.

Pity the poor lighthouse keeper! When other folks are sitting down to a seasonable meal of turkey, Christmas pudding and mince pies on December 25, these saviours of our shipping are often confronted with such unimaginative and unexciting repasts as bully beef.

This, of course, is entirely due to the stormy seas which often prevent relief ships, bringing supplies, from reaching the lighthouses in time for Christmas day.

The plight of the lighthouse men has excited some sympathy in Parliament, and a demand was made that in future, whatever the weather, some action (it was not suggested what) should be taken to ensure that these men sit down to a traditional Christmas dinner.

Perhaps a nice feather-like dried turkey or goose would help to take their minds off the raging seas?

Clamping down price control on basic foodstuffs—such as butter— in times of temporary shortage, would not relieve the shortage. Nor would it increase supplies or improve distribution.

This was the Government's view, expressed by the Agriculture Minister, to a price control proposal by a Labour M.P., Mr. William Warbey (Ashfield).

"Roast beef is radio-active," Lord Hailsham, Minister for Science, told a somewhat startled House of Lords, during a debate on the dangers of radio-active substances. He qualified his alarming disclosure, however, by explaining that the radio-activity in a joint of beef was so diluted as to be not dangerous.

And with this assurance the peers were able to face up again to the roast beef of old England.

Olympia will be Anti-Corrosion HQ in 1960

Plans are being made to ensure that London's Olympia is the focus of the anti-corrosion drive in 1960. Participation by the largest and most representative companies in the "anti-corrosion" industry will make the Corrosion Exhibition, 1960, the biggest and most comprehensive display of its kind. Already two-thirds of the space in the Empire Hall, Olympia, has been reserved—and the exhibition does not open until November 29.

Paints, plastics, rubbers, plating, resistant metals and alloys, cathodic protection, glass-lined plant, inhibitors, temporary protectives and protective tapes are among the products which will be on show. Corrosion science will be represented by the Department of Scientific and Industrial Research, who will feature the work of the Corrosion Group at Teddington. The D.S.I.R. stand at the 1959 Corrosion Exhibition attracted much attention.

Among well-known companies which have reserved stands are British Oxygen, Shell Chemicals, I.C.I., Albright and Wilson, Dunlop, Yorkshire Imperial Metals, Geigy, Enamelled Metal Products, Ciba and Hercules Powder Co.

The Corrosion Exhibition will open at 11 a.m. on Tuesday, November 29, and will remain open for the next three days—until Friday, December 2. Location is the Empire Hall, Olympia, London.

Enquiries for remaining stand reservations should be made immediately to the Organiser, Leonard Hill House, Eden Street, London, N.W.1. (Euston 5911).

PEOPLE

A number of new appointments have recently been announced by H. J. Heinz Co., as a result of the greatly increased production capacity following the opening of Kitt Green. Manufacturing capacity development will be the responsibility of MR. C. HAESLER, whose task will be the planning, initiating and co-ordinating of all manufacturing development projects. He joined the firm in 1932 and has served as head of various departments, factory manager at Standish, and as manager of the Harlesden factory since 1950.

MR. L. E. SULLIVAN has been appointed manager of factories. He joined the company in 1938 as an assistant in the personnel department. After serving during the war in the Royal Navy he was appointed successively assistant factory manager and factory manager, Standish, and since 1938 manager of the northern factories, which include Kitt Green.

▪

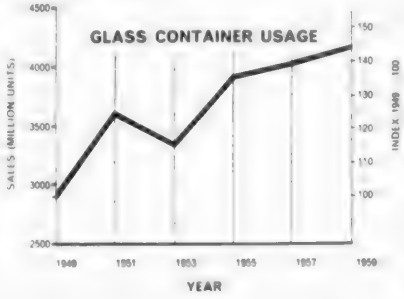
MR. R. A. MACKNESS, Senior Research Officer in the Farm Economics Branch of the School of Agriculture, Cambridge, has been appointed Deputy Chief Officer of the Pig Industry Development Authority. He will take up the appointment on April 1.

Mr. Mackness joined the research staff at Cambridge in 1946, becoming Senior Agricultural Economist in 1952 and Senior Research Officer in 1957. In recent years his interest has been mainly in meat supplies, and he has published papers on seasonality, prices and economics in the United Kingdom and in the principal exporting countries.

During the war he was in the Royal Air Force, first on flying duties and later as instructor and adjutant to the Edinburgh University Air Squadron.

Record glass container sales in 1959

Sales of glass bottles and jars for 1959 reached a record level of 4,157 million units, according to the Glass Manufacturers' Federation. This is an increase of 43·5% over ten years since 1949 and confirms the post-war trend of glass container sales.



Mr. L. E. Sullivan

Mr. C. Haesler

Mr. A. Webb

MR. A. P. F. ROGERS has been appointed managing director of Haven Foods (Mfg.), Ltd. This company is resuming responsibility for all processing and packing of Haven products at High Wycombe and Manchester.

*

The Minister of Agriculture, Fisheries and Food and the Secretary of State for Scotland, with the approval of the Treasury, have appointed MR. A. J. CHAMPION, J.P., to be a Government Director of the British Sugar Corporation in place of LT.-COL. J. LESLIE, who has retired.

*

MR. J. M. KERSHAW, director of development and market research, has been appointed alternate to MR. T. P. BERINGTON on the board of Monsanto Chemicals, Ltd.

Mr. Kershaw, who joined Monsanto in 1946, has been responsible for a number of special development projects, including the construction of the company's new factory at Fawley. Before his appointment as director of development and market research he was chief engineer of the company.

▪

SIR ALEXANDER FLECK, K.B.E., D.SC., F.R.S., has been appointed President of the Society of Chemical Industry for 1960-61 in succession to Mons. E. J. Solvay.

Sir Alexander will be installed as President at the Annual Meeting of the Society at Bristol in July.

Sir Alexander has received the Messel and Castner Medals of the Society, of which he has been a member since 1917. He retired from the Chairmanship of Imperial Chemical Industries on February 29, 1960.

U.K. soft drink production

Total ready-to-drink equivalent production of soft drinks during the quarter ending December 31, 1959, was 94,700 galls., according to figures issued by the Commodity Statistics Branch of the Ministry of Agriculture, Fisheries and Food.

A central buying division has been formed by Mac Fisheries, Ltd. MR. ALEC WEBB has been appointed chief buyer, responsible to MR. RODNEY WILLIAMS, supplies director. Forty-four year old Mr. Webb gave up his own business in Billingsgate three years ago to join the company. Since then he has travelled some 50,000 miles studying fish markets in Holland, Norway, Denmark, Germany and Iceland.

Mr. Webb is married and has two daughters aged 20 and 22. He lives at West Park, Mottingham.

▪

MR. BERNARD F. PRENDERGAST has been appointed to the Board of Haven Foods, Ltd., as sales director. He has been closely associated with the development and marketing of the Haven range of packet foods since the company was formed.

*

Tyne Brand Products, Ltd., announce that MR. JOHN REAVILL, M.S.M.A., has been appointed a full member of the board. He was recently appointed sales director and also director in charge of export. He has had a varied experience in marketing and advertising, and previous to joining this company held important executive positions with leading biscuit companies.

▪

MR. J. BOS has been appointed managing director of Polak and Schwarz (Pty), Ltd., in Roodepoort, Transvaal.

He was previously managing director of Polak and Schwarz's Indonesian Company at Djakarta. He will replace the late Mr. J. Wessing, who died on December 9, 1959.

MR. P. L. C. M. KEET has been appointed deputy managing director of Polak and Schwarz International N.V. at Zaandam, Holland. He is in charge of flavour production and sales.

Obituary

The death was announced on January 14 of Mr. Kendall Dyer Doble, President of the Pneumatic Scale Corporation, Ltd., of Quincy, Mass, U.S.A.

OBITA DICTA

● If you want to eat well in England eat three breakfasts daily.—*Mr. Somerset Maugham, quoted in Sunday Times.*

● Alcohol is an excellent liquid for preserving almost everything but secrets.—*Mr. Cary Grant, quoted in Sunday Times.*

● May I suggest that the Primate is quite capable of talking nonsense whereas a piece of Stilton is not?—*Letter in Daily Telegraph.*

● The cow has a leg at each corner and there is no reason to put in machinery to do for her what she has plenty of time to do for herself.—*Speaker at farming conference.*

● I note Lord Mancroft's heart-rending appeal for casinos in this country to attract the tourist trade. I should have thought we needed cooks, not croupiers.—*Letter in Daily Telegraph.*

● One new compartment or package vendor, the "Select Automatic Shop," announces its products in moving lights and after each purchase says: "Thank you. Please call again."—*Press release.*

● Right now jam is taking a real hiding — bashed and battered from all sides like a punch drunk boxer. I suggest, gentlemen, that jam is suffering from a colossal inferiority complex.—*M.D. of Australian jam firm.*

● To a housewife cow is more important than gold. While gold brought about quarrel in many houses, a cow would bring happiness in a quarrelsome house. This is the milky-way to domestic happiness.—*Indian Dairyman.*

● "Outbreaks of hives, overeating, crying jags, dishonesty, sexual deviation and plain orneriness" are reactions that are "triggered" by the early American irritant known as Thanksgiving, a festival dedicated, as its name suggests, to giving thanks.—*Alistair Cooke in The Guardian.*

● At Preston, dramatically, Dr. Moore paused for a glass of honey and hot water and a foot massage. At Euxton, remarkably, she stopped for tomatoes and dates. A few miles further on she turned off the road for a vegetarian *hors d'œuvres* in a restaurant. Since all this time she was moving in and out of the circulation areas of different newspapers there was a press conference with every tomato, so to speak.—*The Guardian.*

"Flavour Seals," Frood's plastic packs of ready-cooked frozen food, which have been available to caterers for some months, are now in the retail shops. The picture shows one of the vacuum-sealing machines used at Cadby Hall for producing these packs.

Frood's vacuum packs now in shops

"Flavour Seals," the new vacuum-sealed packs of ready-cooked frozen food launched to caterers several months ago, are now on sale to the public. It is planned eventually to widen distribution to the whole of the country.

The size and shape of the pack have been changed so that it takes only 6 min., instead of the original 15, to heat in boiling water. Three new dishes have been added to the range, which now comprises Braised Steak, Tripe and Onions, Stewed Beef Garni, Braised Steak with Vegetables, Stewed Steak with Onions, and Spring Lamb Stew.

Machinery has recently been installed at Cadby Hall to cope with the anticipated public demand for the packs. Two main types of machinery are used, a circular filler and vacuum sealer, both made in France and imported by Felbel Jucker and Co.

Findus to form new company in U.K.

The Findus Group announces that it is the intention to incorporate in England in the near future a new company which will be a subsidiary of AB Findus International, and which will be known as "Findus International (Great Britain), Ltd." This company will perform the functions which have hitherto been performed in England by Findus, Ltd., which was incorporated in 1958, and will be located at Grimsby; it becomes responsible for the operation of plant for the completing and processing of certain frozen food products which will shortly be established. Temporary premises have been taken, and negotiations are in hand for the purchase of a suitable site for the erection of a factory.

These arrangements do not affect the position of Manuels Frosted Foods, Ltd., as the sole national distributors of Findus frozen foods within the United Kingdom.

Back numbers of FOOD MANUFACTURE available

Copies of this journal from January, 1948, to November, 1948, are available free (subject to postage being paid) from Mr. J. E. Murdoch, 21, Westbourne Road, Wolverhampton.

New town near Glasgow wants industry

Cumbernauld, 14 miles east of Glasgow on the main line to Stirling, is the most recent new town designated by the Government, aims at a population of 50,000 as soon as possible. Its object is to help relieve overcrowding in Glasgow.

A brochure recently published by the Cumbernauld Development Corporation describes the many advantages which the new town can offer industrial firms seeking modern buildings, facilities for expansion, excellent communications and skilled labour, details of which can be obtained from the General Manager, Cumbernauld Development Corporation, Cumbernauld House, Cumbernauld, by Glasgow.

New creamery near Aberdeen is Scotland's largest

A new creamery which has been built at Bucksburn, near Aberdeen, at an estimated cost of £500,000 for the Aberdeen and District Milk Marketing Board, is the largest of its kind in Scotland and one of the largest in Britain.

The creamery is named "Twin Spires," a revival of a brand name used before the war by the board, and it will be officially opened by Mr. J. Leburn, Under-Secretary of State, Scottish Office, on April 19.

The project took almost three years to complete, on a site of about 3 acres, and has a total reception capacity of 9,000 galls. of milk an hour. There is also a pre-condensery leased to the makers of *Carnation* evaporated milk. The total staff at the creamery is about 110.

It replaces the present out-dated Lillybank creamery at Kittybrewster, near Aberdeen.

Aberdeen's experimental factory to close?

The Ministry of Food's experimental factory in Greyhope Road, Aberdeen, which has become world famous through its work on the dehydration of foods, may be closed down next year There is a likelihood that development work on dehydration at the factory will cease in March, 1961.

"What will happen after that we just don't know meantime," said Mr. S. W. F. Hanson, officer in charge. The situation is under discussion. "Since the factory was opened in 1951 its major work has been devoted to dehydration. But we also have laboratory research and other development sections, and it may be that these will be kept open or that we will turn to other development work.

"Consultative committees are meantime considering the whole question on a national scale and everything is in the air at the moment."

The factory has a staff of about 150, of whom a substantial number work on the dehydration side. A new accelerated freeze-drying pilot plant, purchased by Armours, the American meat firm, to the specifications of the Greyhope Road staff, is to be installed at the factory in the near future for further experiments on dehydration to be made until the beginning of next year.

Forthcoming Meetings

S.C.I. Food Group, 14, Belgrave Square, London, S.W.1, Wednesday, April 13: Nutrition Panel A.G.M., 6.15 p.m. (Chairman, Dr. F. Aylward).

Wednesday, April 27: Joint meeting with Royal Society of Health, Torquay: "From Farm to Table-processing of Food"; (*a*) Bread; (*b*) Meat; (*c*) Vegetables.

New products. (*Top*): Chocolate Blackcurrant Creams, successful on the export market, are now introduced to the home trade by Frears, Ltd. (*Bottom*): The pack designed for Stoddart and Hansford's new sponge mix.

Frear's export line now on home market

Frears, Ltd., announce the introduction of Chocolate Blackcurrant Creams. The firm say that this line has previously proved very successful in Canada and elsewhere in the export market, and hope it will prove equally popular at home.

The biscuit consists of a short-eating base, topped with a blackcurrant cream filling and coated with milk chocolate, and is packed in 8 oz. units. The wrapper bears a reproduction of the contents and a pictorial illustration of the fruit, which stand out brightly on a background of pale lemon and blackcurrant colours.

The new line retails at 2s. 2d. per packet. Trade price is 20s. 9d. for an outer containing 12 packets.

New sponge mix

What is claimed to be a completely new type of sponge mix—Viota Iced Spongelets—has been launched by Stoddart and Hansford, Ltd.

With the addition of only one fresh egg, each packet yields fifteen individual iced sponges. Each packet is complete with the necessary baking cases and icing sugar.

Company Profits & Prospects

Henry Simon (Holdings), Ltd.

The directors of Henry Simon (Holdings), Ltd., have declared a special distribution of 6d. per share on the 5,140,500 Ordinary shares of the company. This distribution will be paid out of the realised capital profits of the company.

Meredith and Drew, Ltd.

For the twelve months ending December 31, 1959, a trading profit of £214,208 was earned, compared with £27,515 for 1958. The chairman said that this result was due principally to the benefits of improved equipment and to the noteworthy improvement in efficiency in every department of the business. In addition, the potato crisp business greatly benefited from lower potato prices than those ruling in 1958. The board have recommended a second interim dividend, payable on March 8, of 2½%, and proposed to re-recommend, at the A.G.M. in May, a final dividend of 3%, with, in addition, a special bonus of 2%.

George Cohen 600 Group

The directors of the George Cohen 600 Group, Ltd., have declared an interim dividend of 4½% actual, less tax, on the £3,125,000 ordinary stock payable March 31, 1960. The half-yearly dividend due on March 31, 1960, on the £1,500.000 4½% cumulative preference stock will be paid at the rate of 4½% per annum, less tax, and the half-yearly dividend due on March 31, 1960, on the £1,000,000 6½% second cumulative preference stock, will be paid at the rate of 6½% per annum, less tax.

Simon Carves, Ltd., and Henry Simon (Holdings), Ltd.

Simon Carves, Ltd., and Henry Simon (Holdings), Ltd., announce that discussions are taking place regarding possible means of closer integration of the two companies and their subsidiaries, which are together known as the Simon Engineering Group. A further announcement will be made in due course.

Horlicks favourable outlook

At the annual general meeting of Horlicks, Ltd., the chairman, Mr. O. P. Horlick, said that the profit for the year ended March 31, 1959, was almost equal to that of the year before, the highest in the history of the firm. During the year there had been a good demand for the chocolate flavoured *Horlicks* and the *Horlicks* tablets.

The group net profit amounted to £1,050,489 (£1,069,032) and a final dividend of 15% (total 25%) was recommended.

Food News Overseas

Italian confectionery industry continues to expand

According to the most recent information the Italian confectionery industry has continued to expand both at home and abroad during the past year. Figures, available for the major branches of the industry, show an average increase of 6% over 1958, and Confindustria—Federation of Italian Industries—experts predict boosting expansion to 10% during 1960.

Despite persisting difficulties, such as heavy taxation and growing competition, particularly in European Common Market areas, the tendency towards steady development which has now lasted over seven years continues to hold good.

The latest statistics, covering the first ten months of 1959, are shown in the table.

Production of toffees, sweets and similar products rose from 9,653 quintals (1 quintal = 100 kilos) to 10,026.

Products	1958 *value in million lire*	1959 *value in million lire*
toffees, candies, confectionery and pastries	680.1	596.7
chocolate and chocolate products	673.0	756.2
cocoa butter ...	2,883.7	4,006.7
cocoa powder ...	699.6	1,421.3
biscuits	128.4	198.8
pastry products : cakes	59.9	209.4
candied sweets ...	384.1	337.6

Production of cocoa butter and cocoa powder almost doubled: the first increasing from 29,413 quintals to 40,464 and the latter from 25,149 to 37,246 in 1959.

Another spectacular result was achieved in the export of cakes and pastries, leaping from 785 quintals in 1958 to 2,272 quintals in 1959, due to sweeping mechanisation of production equipment.

Today it is estimated that the output capacity of Italy's confectionery industry, which has undergone thorough automation during the past year, stands at over 4 million quintals a year. It occupies some 45,000 persons and has set up its own professional training centres in all major cities of the country.

Cures for arthritis and hay fever claimed

The most interesting and inspiring development in the dairy industry today is the production and use of anti-body milks for the treatment of human ailments, Mr. E. G. Roberts, president of the Australian Dairy Farmers' Federation, said in his annual report recently, and added that the story of the development of anti-body milks had been outlined to him at the University of Minnesota by Dr W. E. Petersen, world-famed authority on the science of milk production and animal husbandry. Dr. Petersen had obtained considerable success through the use of this milk for the treatment of rheumatoid arthritis and hay fever.

In his report to the Australian Dairy Produce Board, Mr. Roberts recommended that Australia should send a representative to Minnesota to study the techniques involved in the production, control and use of anti-body milks with a view to having them produced in Australia.

This recommendation is being considered in Australia by the Dairy Produce Research Committee.

Australia-Canada trade agreement

A new trade agreement has been signed in Canberra between Australia and Canada by Australian Trade Minister McEwen and Canadian High Commissioner MacDermot.

Mr. McEwen said concessions had been made by both countries. Canada agreed to renew Australia's margin of preferences on such commodities as high test raw sugar, dried fruits, brandy, wines and meat products. Temporarily reduced rates of duty on Australian lamb and mutton, canned beef and most canned fruit become permanent.

Australia has agreed to bind present rates of duty on canned salmon and sardines, book-keeping and tabulating machines, cash registers and asbestos.

Canadian Trade Minister Churchill stated in Ottawa that the treaty would provide new safeguards and increased access to Australia by Canadian exporters. The pact obliged Australia to give Canada the same preferential treatment as that accorded to Britain.

"No, Bilscroft—I don't think you quite understood when I said I wanted to see a big jam turnover this year."

New Swiss bottle printing machine

An offset machine, designed to print up to 3,600 plastic or aluminium bottles per hour in up to four colours, has been developed in Switzerland. Giving details, *Printing Abstracts*, published by the Printing, Packaging and Allied Trades Research Association, notes that the machine employs compressed air for inflating the bottles in the printing position. The four colours are printed into each other on to the lower blanket and directly impressed on to the bottle in one operation.

Nigeria to have sugar industry?

By November of this year it should be possible to decide whether to go ahead with the establishment of a sugar industry in Nigeria. Announcing this development from Lagos, Barclays Bank D.C.O. says that a report made to the Sugar Advisory Syndicate recently shows that climatic conditions seem suitable for growth and that physically and chemically the substance of the soil is more than adequate. Results from experimental sugar cane plots in Northern Nigeria have so far been encouraging.

Change of address: Canadian Fish Inspection Lab.

The new address of the Fish Inspection Laboratory, Canadian Department of Fisheries (Pacific Area), is 326, Howe Street, Vancouver 1, B.C., Canada.

Ice cream company's gift to Durban hospital

The Eldorado Ice Cream Co. recently sent 100 galls. of frozen milk to the King Edward VIII Hospital at Durban, which has directed the milk to the Malnutrition Relief Committee. The milk had been treated with ultasonic vibrations and frozen before shipment; in this state it keeps for 18 months, but once thawed it must be used immediately. The milk arrived on February 6 packed in 1,000 ½ pint cartons, and was distributed to needy African families. In a letter to the company the hospital secretary said that while in hospital children receive the best medical attention and are placed on a carefully balanced diet, but when they returned to their homes all the good that is done in hospital is often undone.

Madrid symposium in October

The sixth Symposium on the use of Microbiological Organisms in Food, to be held from October 10-16 in Madrid, will deal with the effects on the hygiene and palatability of foodstuffs resulting from the uses of bacteria, moulds, yeasts and enzymes in the preparation and preservation of the products.

South Africa's sugar estimates

From Johannesburg, Barclays Bank D.C.O. says that South Africa's estimated sugar production for the 1959-60 season as at the end of last year was 1,036,681 tons of sugar to be manufactured by Union factories plus 19,500 tons to be manufactured in Swaziland, or a total of 1,056,181 tons. This represents a drop of 869 tons when compared with the estimate at the end of November.

Actual production in the Union at the end of December was 973,617 tons made from 8,627,785 tons of cane, a cane to sugar ratio of 8.81. Production for the similar period last year was 971,318 tons of sugar manufactured from 9,755,014 tons of cane.

Total sales to the end of December were 502,316 tons of sugar compared with 492,063 tons a year ago.

Canned meat in Italy

Production and exports of meat conserves in Italy has shown favourable progress during the past year despite increased competition on the home market due to the European Common Market and a 10% reduction on import tariff rates for West German and French products. Major Italian producers, such as Simmenthal, who dispose of the most modern facilities and have increased output by almost 50% over 1958, have compensated for a temporary loss of regional markets in northern Italy due to imports from Germany, France and, to a lesser extent, Dutch Zwan products, by boosting exports to Middle East countries and by making headway in such competitive areas as Switzerland, Jugoslavia and Austria.

The Italian industry, as that throughout Western Europe, has of course suffered from the reduction of Argentine exports and the complete stopping of Brazilian supplies during the past year. But a widespread renovation of livestock policies, inaugurated by the government under the current Vanoni Plan, compensated to a large extent for this loss of raw materials with the result that the meat canning industry, during the first nine months of 1959, was able to export some 39,284 quintals (1 quintal = 100 kg.), and unofficial figures confirm that the previous year's record of 54,611 quintals (1958) had been passed by the end of the past year.

Technical Press Review

April

Dairy Engineering.—Strength of Bottles; English Cheeses in a New Form—2; Milk in Amber Bottles; Plastics for Milk Packaging; Bottle Washing and Sterilising Problems—1; Practical Cleaning Routines for the Dairy—3.

Manufacturing Chemist.—Special Feature: Mixing; Sulphosuccinates; Worm Infestation, a National Problem—2; Suntan Preparations; Why Industry should do as little Fundamental Research as possible.

World Crops.—Special number dealing with Irrigation; Inland Waterways in the U.S.S.R.; Rice Irrigation in California; Water for Irrigation in the Po Valley; Machines for Crop Production under Irrigation—2; Manuring of Crops in the Far East.

Petroleum.—Performance of Aluminium in Refineries; The Tanker Anode; Safety Considerations; Wrapping Tapes for Pipe Protection; Cleaing Refinery Equipment in situ; Oilfield Development—6.

Automation Progress.—Industrial Applications of *p*H Control; Information Searching by Computer; How to use Multiple Disc Magnetic Clutches; Attitudes to Automation in Britain and U.S.A.; Pneumatics in Automation; Automation in France; Simplified Industrial Controllers; Control of Space Heating.

Fibres and Plastics.—Cyanœthylation of Cotton; Backings for Tufted Carpets; Synthetic Fibres in Paper Manufacture; Fibre Blending on the Cotton System; Melt-Roller Coating of Fibres; Mothproofing Textiles; Review of Plastics Moulding Plant; Fibreglass-Polyester — some Recent Developments.

Chemical and Process Engineering.—Materials of Construction for Chemical Plant; Thermocouples in Industry; Gravity Concentration and Magnetic Separation of Minerals; Particle Size Determination; Nuclear Fuel Elements in France.

Paint Manufacture.—Instrumentation in the Paint Industry; Paint Control Testing; Advanced Paint Chemistry—8; Segregated Pilchard Oils—2; Styrenated Epoxide Esters.

For specimen copies write to Leonard Hill House, Eden Street, London, N.W.1.

How Clean are your Containers?

(*Concluded from page 157*)

Considerable advances in this direction have also been made towards minimising the dosage hazard in washing machines. A new electronic feeding device incorporates a control unit which constantly tests the concentration of the wash solution and dispenses when needed the correct quantity of powder detergent into the tank of the machine.

Thus the detergent and/or steriliser can be maintained at a predetermined or desired solution strength.

Another type of automatic dispenser recommended for churn washing machines is one which synchronises the operating cycle of the whistle valve controlling the flow through the pre-rinse nozzle. When the valve is open a liquid cleaner is drawn into the system and the wash solution kept at opiminium strength automatically.

The examples given above are designed expressly to work with the products formulated by the manufacturers and obviously all such attempts to make dosages in machines correct, automatic, and continuous, must represent a great step forward in maintaining their routine efficiency in practice and keeping them clean.

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Advances in Food Technology

ANALYSIS

Antibiotics in food

A simple and sufficiently sensitive test for the presumptive detection of antibiotics in foods has been developed, based on the principle that the food under investigation is mixed with double-strength agar containing triphenyltetrazolium chloride as an indicator of bacterial growth. The agar dispersion so obtained is streak-inoculated with suitable test strains and incubated, using as a blank a mixture of agar and an identical food sample known to be free from added antibiotics.

For the presumptive detection of antibiotics *Staphylococcus aureus* and *Streptococcus cremoris* are used as test organisms. For use in the confirmative and completed tests the usual selection of test bacteria and strains, which have been rendered resistant to a certain antibiotic, may be used.—L. P. Van der Mijll Dekker, D. A. A. Mossel, A. S. de Bruin and A. Manten, *J. Sci. Food Agric.*, 1959, **10** (9).

Protein content of wheat and flour

A rapid turbidimetric method, which gives reproducible results, is to shake flour or ground wheat (1·0 gram.) with 100 millilitres of 0·05 *N* NaO H for 15 min., and centrifuge the suspension at 6,000 r.p.m. for up to 10 min. Dilute a 5-millilitre aliquot of the clear supernatant liquid to 50 millilitres with aqueous 3% sulphosalicylic acid solution, mix thoroughly, and immediately measure the turbidity of a 4-centimetre layer in a photo-electric colorimeter with a 540-millilitre micron filter against a blank of sulpho-salicylic acid solution. Determine the protein by reference to a calibration curve.—L. Feinstein and J. R. Hart, *Cereal Chemistry*, 1959, **36** (2).

BACTERIOLOGY

Sulphite-reducing Clostridia in foods

For the presumptive enumeration of sulphite-reducing clostridia in foods, a modification of the Wilson and Blair type agar, containing no dextrose, 0·05% w/v Na_2SO_3, H_2O (SO_2 content about 25%) and rendered more selective by incorporating 10 p.p.m. of polymyxin B sulphate, has been found effective. It is recommended that the medium is incubated in oval cross-section ("Miller-Prickett") tubes at 32° for up to 3 days.

The medium permits the growth of fæcal streptococci and staphylococci which form a background of white colonies which do not interfere unduly. However, many *Proteus* species produce black colonies in this medium, and in many instances confirmation of a representative selection of the black colonies obtained is necessary.

Where the cultures produce spores, purification for further study can be attained by heating the colonies for 1 min. at 80° and subculturing in poured plates of sulphite-polymyxin-agar. If the strains are non-sporulating conventional purification methods should be applied to the unheated cultures, using this medium. Black colonies reisolated in one of these ways can be confirmed by examining their morphology and growth under aerobiosis and anaerobiosis, including catalase reaction, and, if required, further identified by studying fermentation of glucose, lactose, saccharose, milk and mannitol, the reduction of nitrate, the liquefaction of gelatin, and the formation of indole.—D. A. A. Mossel, *J. Sci. Food Agric.*, 1959, **10** (12).

FUMIGATION

Gassing of maize with methyl bromide

A large, sealed maize store (over one million cubic feet) was filled with methyl bromide gas and fumigation continued for 5 days. Gas sampling indicated excellent results. The method was cheaper and more efficient than the usual sheet fumigations. The amount of gas needed was less than expected, and the distribution was good, although no fan or gas recirculating equipment was employed. The greatest advantage was that cross-infestation was practically eliminated.—W. M. Graham, *J. Sci. Food Agric.*, 1959, **10** (9).

MEAT PRESERVATION

Chill Room Air

A German scientist (Karl Ackermann) has carried out research on the bacterial content of chill room air. The investigations were carried out in different rooms of the cooling plant of Ludwigshafen abattoir. The bacterial content was found to be dependent on operating phases.

In spite of heavy air circulation, the chill tunnel was found to have a lower bacterial content of the air than the main cooler. This fact, which is regarded as an advantage, might be connected with the fact that the surface of the carcass sides is rapidly dried by the strong air stream so that micro-organisms have difficulty in clinging.

In order to ascertain the best means of controlling the bacterial content in coolers, pilot tests were also carried out, under practical conditions, with disinfectants and ultra-violet irradiation.—Wagemann, *Die Fleischwirtschaft*, 1959, **11**, 917.

Aids to Hygiene

(*Concluded from page* 159)

Baker, Ltd., manufacture methyl bromide for fumigation under the trade name of *Embafume*.

Sanitising paints

A range of fungicidal paints claimed to be entirely free from poisonous or harmful chemicals is the *Fungi-Chek* range produced by Denton Edwards Paints, Ltd. These paints are available in matt, gloss or emulsion form in twenty-two colours, and the makers say they can be used with absolute safety in all conditions.

The *Metavin* series of paints manufactured by Croda, Ltd., are made with inert plastics instead of natural oils and resins, and are claimed to have great resistance to many chemicals as well as to bacteria and fungi. The makers say they are odourless, non-toxic and non-inflammable, and can be obtained in a full range of attractive colours which are easy to apply and dry quickly.

Hygienic floors

The use of detergents for cleaning brings its own problems; their extremely high penetrating power enables them to enter cracks in walls, floors and tiling with a greater ease than ordinary liquids, often with disastrous effects on the cement holding the wall or floor surface material. Acalor (1948), Ltd., make a range of impermeable cements which are proof against cracking; one in particular is recommended by them for very wet floors and those most likely to be subjected to the effect of detergents.

Packaging

Packs by British Cellophane, Ltd. (*Left*): **These " fractional " packs of flour consist of 6 2-lb. printed bags (each carrying a 4-oz. level mark) encased in a printed card sleeve, the whole being in an overwrap of Cellophane film.** (*Right*): **These new packs are 6 × 4 in. Cellophane bags printed in red and green on white.**

Cellophane packs

To appeal to the modern housewife, who does most of her baking on a small scale, Lily Brand Flour Co., Ltd., St. Albans, have recently launched a novel " fractional " pack of flour claimed to combine good looks with maximum consumer-convenience.

The pack consists of 6 ½-lb. printed bags (each carrying a 4-oz. level mark) encased in a printed card sleeve. A heat-sealed overwrap of transparent, moistureproof *Cellophane* film holds the paper bags firmly in position, and clearly displays their green- and reverse-printed faces at both sides of the pack. The film also heightens the effect of the orange-, green-, and reverse-printed sleeve, which carries a description of contents and brand name (front) and promotional copy (rear).

By cutting out the need for an all-round cardboard carton, the film overwrap also helps the manufacturer keep down packaging costs, it is claimed.

Miracle Food Products, Wetherby, Yorks., have again chosen a pack of printed *Cellophane* cellulose film to launch a new line. This is a parsley sauce mix made ready simply by adding water.

High gloss wrappers

Material for a new glossy pack for Walters' *Potato Puffs*, a product of the potato crisp type, is now being produced, printed and supplied on the reel by the Robinson Waxed Paper Co., Ltd. It is glassine, treated with one of the RWP range of *Lustralac* proprietary plastic finishes, resulting in a simple but effective pack, which, it is claimed, in addition to having good moisture-vapour resistance and appearance, is strong enough to resist perforation by the puffs.

First injection-moulded polystyrene bottle made for Sarsons by Pioneer Plastic Containers, Ltd., from Shell Chemical Co.'s polystyrene.

The pack is of the pillow-type, with top and bottom heat seals, and is formed, filled and sealed on fully automatic machines. A simple two-colour design in red and yellow is employed, with use of transparent areas to display the contents.

For maximum point-of-sale appeal for *Jellimallo*, a new filled milk chocolate bar, recently introduced by Nestlés, the makers have chosen a simple but effective high gloss heat-sealing wrapper, consisting of paper coated with *Lustralac*.

The wrapper is printed gravure, with a mauve-tinted dark background contrasting with white, and a third identifying colour for each of the three

Printed in 3 colours, wrappers for these marshmallow bars are Lustralac coated paper produced by the Robinson Waxed Paper Co., Ltd.

flavours. As the name suggests, the bars are filled with jelly and marshmallow and the flavours now available are raspberry, tangerine and lime. Each bar is in two sections and is packed on a board skillet. Wrapped bars are supplied by Nestlés in a display outer.

Polystyrene vinegar containers

For the first time vinegar is being sold in polystyrene bottles claimed to be attractive enough to be put straight on the table. The container is specially made for Sarson's, Ltd., by Pioneer Plastic Containers, Ltd., from Shell Chemical Co.'s polystyrene. The bottle has a red top and a crystal-clear base which shows when the vinegar level is getting low. A drip proof lip eliminates the danger of messy rings on the tablecloth.

The press-on polyethylene stopper is airtight and is easy to uncap and replace. The container is claimed to be light to carry, hygienic and will not shatter if dropped. It is also said to be suitable for salad dressings and cold sauces.

Recent Patents

COMPLETE SPECIFICATIONS ACCEPTED

829,188. R. H. FILMER, LTD., and M. J. KIRBY: Packing devices for fruit, eggs, and the like.

829,556. FOOD MACHINERY AND CHEMICAL CORPORATION: Insecticidal compositions.

829,500. A. C. RENISOFF: Refrigerated tanks.

829,688. B. CLAYTON: Animal feed products.

829,313. FORGROVE MACHINERY CO., LTD.: Separation of articles from a stack.

829,208. W. L. MORRISON: Chilling, storage and transport of foodstuffs and the like.

829,329. APEX CONSTRUCTION, LTD., and W. C. PECK: Flexible tube pumps.

829,381. PACKAGE MACHINERY CO.: Wrapping machines.

829,713. WATNEY MANN, LTD.: Yeast boats and fermentation vats.

829,340. PACKAGE MACHINERY CO.: Controlled feeding means for machines for slicing bread and the like.

829,670. METAL BOX CO.: Containers.

829,675. R. MÖLLER: Apparatus for mixing, kneading and squelching materials, especially chocolate.

829,484. A. C. DENISOFF: Refrigeration apparatus.

829,881. ZORA, TOVARNA NA COKOLADU A CUKROVINKY, NARODNI PODNIK, and F. PALIK: Method and apparatus for the production of chocolate masses.

830,039. J. NARA: Manufacture of wheat flour.

830,229. HANSELLA WERKE A. HENKEL A.G.: Machine for the stamping or moulding of sweetmeats.

829,758. FORGROVE MACHINERY CO., LTD.: Wrapping machines.

829,804. N. J. GOODE: Ice lollies in plastic bags, to be sold as pre-packs.

830,169. F. D. FOULKES: Devices for preparing radishes or the like.

830,657. MONSANTO CHEMICAL CO.: Pest control compositions.

830,476. T. BARKER AND SONS, LTD., and F. BARKER: Manufacture of bread.

830,672. J. C. WEBER G.M.B.H.: Display and storage units for foodstuffs in opened containers.

830,484. OATLEY TECHNICAL DEVELOPMENTS, LTD.: Cooking apparatus.

830,539. G. A. TOMIK: Dispenser mechanism for dispensing ice cream or like soft, semi-solid substances.

830,260 SALEM-BROSIUS, INC.: Method of disinfecting potable waters.

830,964. J. THOMPSON-KENNICOTT, LTD.: Method of water purification.

830,961. R. W. GROOM: Method of cleansing the interior surfaces of tanks, chambers and like confined spaces.

831,146. A. G. KALLE AND CO.: Manufacture of artificial sausage casings.

831,075. CIBA, LTD.: Pest-combating preparations.

831,132. CHEMISCHE FABRIK BUDERHEIM A.G.: Process for the treatment of meat, meat-containing products and blood.

831,135. ROSE BROS. (GAINSBOROUGH), LTD.: Sweet packages.

830,946. J. G. STERK: Method of treating cocoa powder.

831,154. SAYAMA TEA ESTATES, LTD., and W. R. WORTHINGTON: Apparatus for the treatment of tea leaf.

831,156. KENWOOD MANUFACTURING CO., LTD.: Mixing machines.

830,760. G. SCOTT AND SON (LONDON), LTD., and T. S. LING: Processes and apparatus for the manufacture of fruit and vegetable juice preparations.

830,998. J. N. HOLMES and F. C. PRIME: Apparatus for trimming the stalks of brussel sprouts.

831,258. INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE and SOC. PROTECTOR: Vitaminised products.

830,951. COMMONWEALTH ENGINEERING CO. OF OHIO: Diet supplements containing dextran.

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Trade Marks

ORCHARD PLUME.—786,860. Canned fruits. **Balkwill and Storey, Ltd.,** 136-137, Upper Thames Street, London, E.C.4.

UNCLE MAC.—790,718. Fish (except live fish), fish products (for food), tinned fruit, fruit pulp, tinned vegetables, peeled tomatoes and tomato paste. **Alfred M. MacGrotty and Co. (Portugal), Ltd.,** 41, Eastcheap, London, E.C.3.

CONDA.—791,941. Meat; fish, poultry and game, none being live; meat extracts; preserved, dried and cooked fruits and vegetables; jams; soups, concentrated soups and soup preparations in liquid or powder form; milk; milk products and dairy products, all being for food. **N.V. Hero Conserven Breda,** Teteringsedijk 277, Teteringen, near Breda, Holland.

PAMINA.—792,262. Milk, milk products and dairy products, all for food. **Coöperatieve Condensfabriek "Gelderlandoverijssel" G.A.,** Harderwijkerstraat 6, Deventer, Holland.

CHIQUITA'S.—795,115. All goods included in Class 29. **United Fruit Company,** 80, Federal Street, Boston, 10, State of Massachusetts, United States of America.

CHICKATO.—793,860. Soups. **W. A. Baxter and Sons, Ltd.,** The Northern Preserve Works, Fochabers, Morayshire, Scotland.

GOLD SHEAF.—795,119. Milk and milk products (for food). **Co-operative Wholesale Society, Ltd.,** 1, Balloon Street, Manchester.

BRISK. 794,309. Water biscuits. **The Nestlé Company, Ltd.,** St. George's House, Wood Street, London, E.C.2.

CHAMP.—795,265. Non-medicated sugar confectionery, not being coffee flavoured. **Chix Confectionery Company, Ltd.,** 15D, Argyll Avenue, Trading Estate, Slough, Buckinghamshire.

GIGI.—796,492. Biscuits (other than biscuits for animals). **William Macdonald and Sons (Biscuits), Ltd.,** Glengarry Biscuit Bakery, Earl Haig Road, Hillington, Glasgow, S.W.2.

SNAKPAK.—779,618. Packets of salted nuts for sale in England and Wales. **Snakpak Food Products, Ltd,** 6, Penylan Road, Cardiff.

ETO.—783,982. Meat, hams, sausages, chicken products (for food), fish and vegetables, all being canned; and frozen meat. **ETO Nahrungsmittelfabriken Richard Graebener,** Kaiserallee 15, Karlsruhe/Baden, Germany.

New Companies

Beford and Thompson, Ltd. (645510.) Mill Lane, Boston. To carry on bus. of millers and mnfrs. of animal foods, etc. £10,000. Dirs.: P. E. L. Periam, R. A. Day and G. Taylor.

Citrelix, Ltd. (645873.) To carry on bus. of mnfrs. of and dlrs. in fruit juice beverages, etc. £100. Subs.: A. W. Plastow and E. Lowman, Bush Lane House, Bush Lane, Cannon Street, London, E.C.4.

Challenge Foods, Ltd. (646353.) Shalesmoor, Sheffield, 3. To take over bus. of buyers, packers and sellers of tea and other foodstuffs carried on by Nicholas and Co. (Sheffield), Ltd., Shalesmoor. £5,000 Dirs.: G. Butler, C. H. Cherry, G. Johnson, E. King, J. Bingham and J. G. Butler.

Delichicks, Ltd. (645422.) 102, High Street, Manchester, 4. To carry on bus. of packers and canners of and dlrs. in broiler fowls, etc. £5,000. Dirs.: H. D. Leete and M. W. Wicks.

Edible Golden Crosses, Ltd. (645471.) 198-204, Lewisham High Street, London, S.E.13. To carry on bus. of bakers' sundriesmen, bakers, biscuit mnfrs., etc. £1,000. Dirs.: F. D. and Mrs. W. K. Simmons and Mrs. D. M. Woodfine.

Fenland Packers, Ltd. (645427.) Midland Bank Chambers, Market Place, Peterborough. To carry on bus. of egg graders and packers, etc. £3,000. Subs.: K. J. Wallis and P. M. Skoulding, 13, Darthill Road, March, Cambs.

Francos (Derby), Ltd. (645876.) 5, Wilson Street, Derby. To take over bus. of an ice cream mnfr. and café propr. £2,000. Dirs.: N. and Mrs. G. Franco.

Imperial Wharf Co. (Greenwich), Ltd. (645562.) To carry on bus. of mnfrs. of and dlrs. in cattle and poultry food, etc. £100. Dirs.: Wm. J. W., Dorothea K. E. M. W. and K. N. W. Fisher.

Jonco, Ltd. (646214.) To carry on the bus. of mnfrs. and bottlers of mineral waters, etc. £1,000. Dirs.: not named.

Kapsumbeiwa Tea Co., Ltd. (645837.) To acquire the Khartoum and Kapsumbeiwa Tea Estate, Kenya, and for that purpose to enter into an agreement with Empire of India and Ceylon Tea Co., Ltd., etc. £300,000. Subs.: M. G. H. Bell and Doreen McDonald, "The Lymes," Ollards Grove, Loughton, Essex.

S. C. Gardner and Sons, Ltd. (647126.) 2, Wellington Road, Dewsbury. Mnfrs. of and dlrs. in chocolate, sweets, ice cream, etc. £2,000. Dirs.: Samuel C. Gardner, Brian G. Gardner, Kenneth Gardner and Geoffrey Gardner.

D. Everitt and Co., Ltd. (647142.) 62, Carlton Road, Romford, Essex. Mnfrs. of and dlrs. in ice cream and iced confections, etc. £100. Dirs.: Douglas I. Everitt and Mrs. Catherine M. Everitt.

Knights Ice Cream Utilities, Ltd. (647166.) 24, Gloucester Place, Brighton, 1. Mnfrs. of and dlrs. in equipment, vehicles and requisites for the ice cream industry. £1,000. Dirs.: Victor F. Knight and Mrs. L. G. Knight.

These particulars of new companies recently registered have been extracted from the daily register of Jordan and Sons, Ltd., Company Registration Agents, 116, Chancery Lane, London, W.C.2.

Number 20 April 1960

The Examination of Edible Oils & Fats (No. 7)

LODERS and NUCOLINE LTD.

INFORMATION BULLETIN

This advertisement is one of a series of Information Bulletins issued by Loders & Nucoline Ltd. Copies are available, together with a folder, on request to Loders & Nucoline Ltd., Unilever House, London, E.C.4.

DILATATION OF FATS

Definition: *The dilatation of a fat may be defined as the isothermal expansion due to change of state from solid to liquid, of a fat which has previously been solidified under carefully prescribed conditions.*

The majority of fat products consist of intimate mixtures of solid and liquid glycerides and it is possible to estimate the percentage of solid fat present at any given temperature by means of dilatometry.

The volume of the solidified fat is determined at different temperatures below the point of complete fusion. The dilatation is usually expressed in microlitres per 25 grams of fat and represents the difference between the volume of solid fat and the volume of the liquid at the same temperature. It has been observed experimentally that 100 grams of completely solidified fat expand in volume approximately 10 millilitres (10,000 microlitres) on melting and from this it will be seen that 1 gram of solidified fat will expand 100 microlitres on melting. This is why a dilatation expressed in microlitres expansion per 1 gram is often referred to as the percentage of Crystal Fat present at a given temperature. It is most useful to plot dilatation values against temperature readings; the shape of the resultant curve will yield useful information about the product and will also show precisely the point of complete fusion. It can be seen that dilatometry is more objective in application than the melting point methods described. These are essentially empirical in nature and yield only limited information whereas dilatometry can determine the ratio of solid and liquid phases at any temperature below that of complete fusion.

Setting Points

The physical examination of fats based on the change of state from liquid to solid has for most products become somewhat outdated. It is still used for confectionery fats of the Cocoa Butter class where it is known as the Cooling Curve. This test observes the behaviour of a melted fat when subjected to a standard cooling procedure in a standard apparatus. The great advantage of this test is its ability to deal with fats which exhibit polymorphism, for no lengthy stabilisation treatment is required when, for example, the change is from solid to liquid, i.e. the melting point. Fats exhibit super cooling and a point is reached when the latent heat of solidification overcomes the cooling effect, and the temperature begins to rise, finally reaching a maximum point. This is often called the Setting Point. If temperature readings throughout the test are plotted each minute, the shape of the resultant curve can yield useful information regarding the likely behaviour of the fat in use.

More recently a test has been devised which is applicable to fats other than those of the Cocoa Butter class. It is more rapid than the Cooling Curve and yields precise results particularly with hydrogenated fats, where it is much more informative than a Slip Point. It can differentiate between two hydrogenated fats which have the same Slip Point but differ in consistency owing to the application of different hardening techniques.

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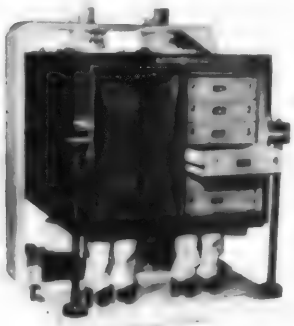

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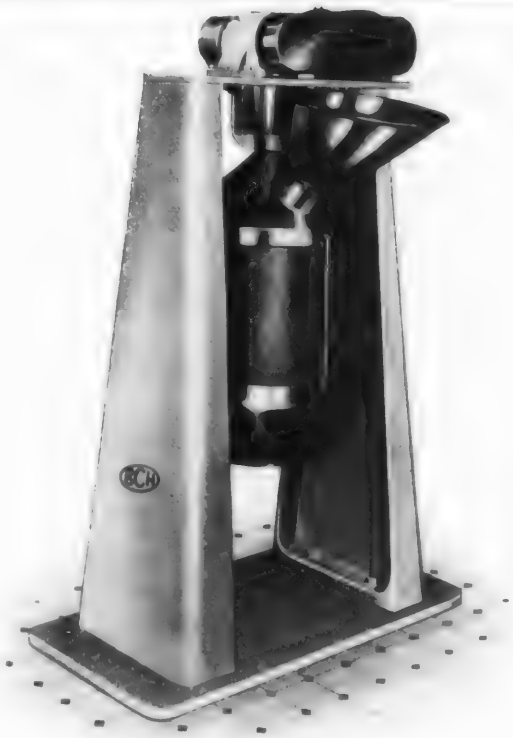

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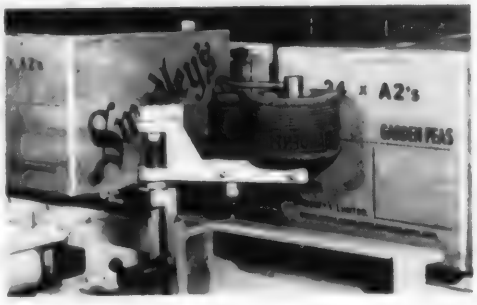

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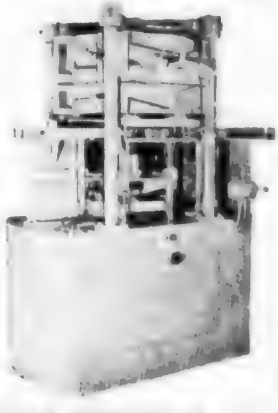

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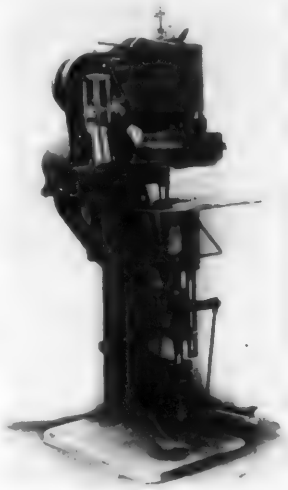

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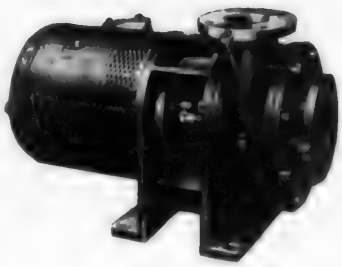

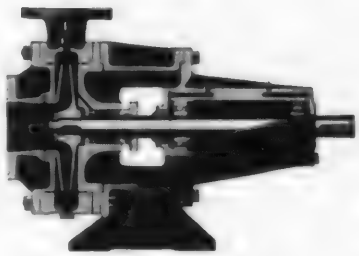

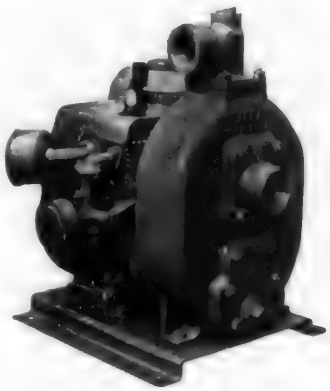

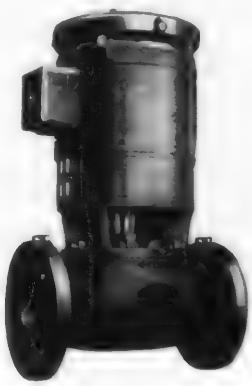

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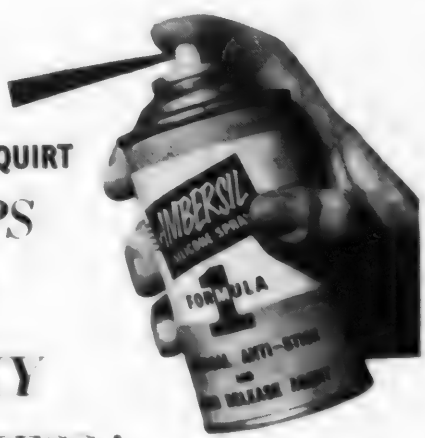

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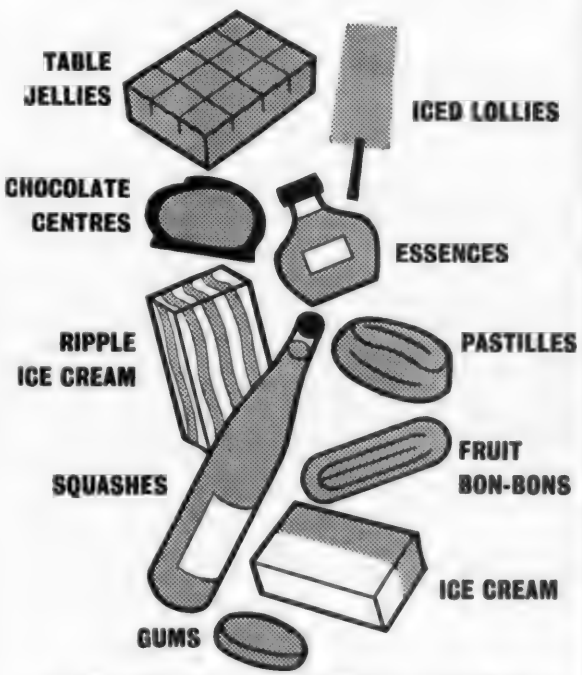

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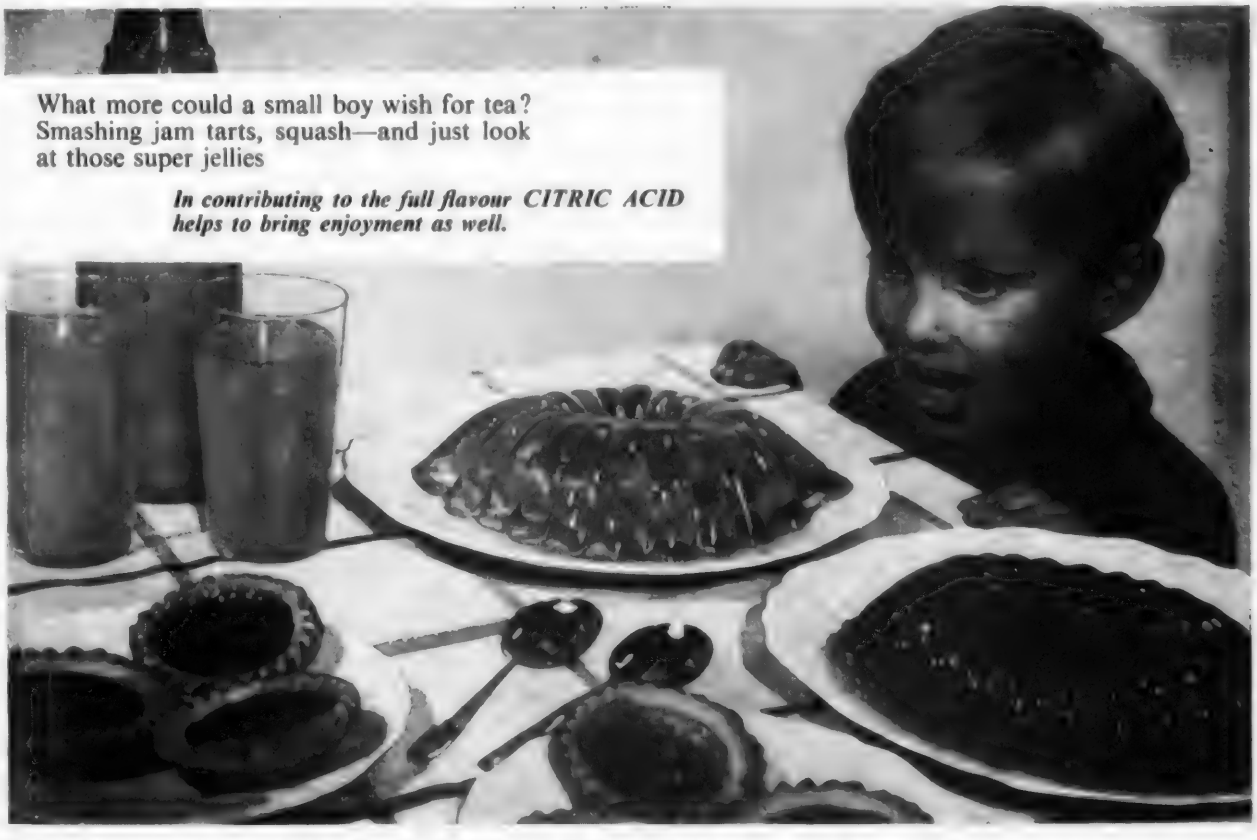

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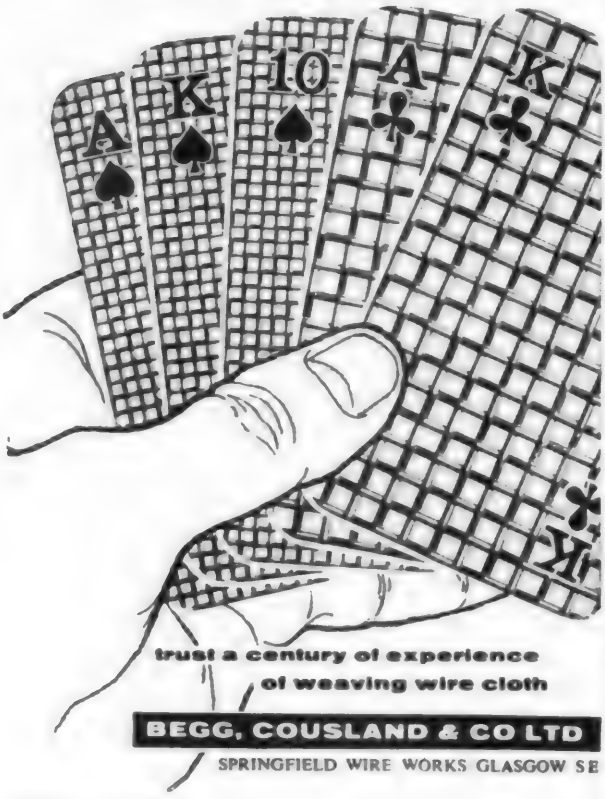

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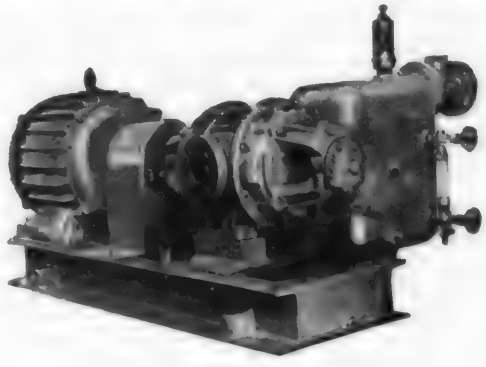

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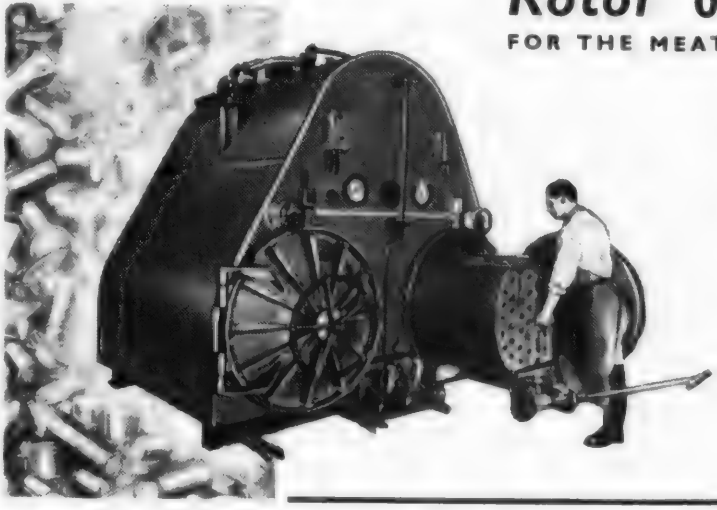

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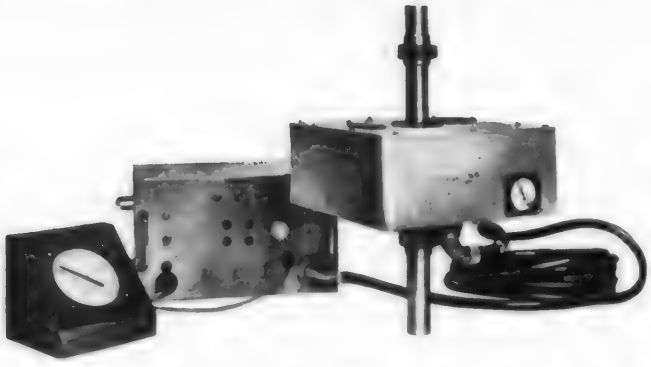

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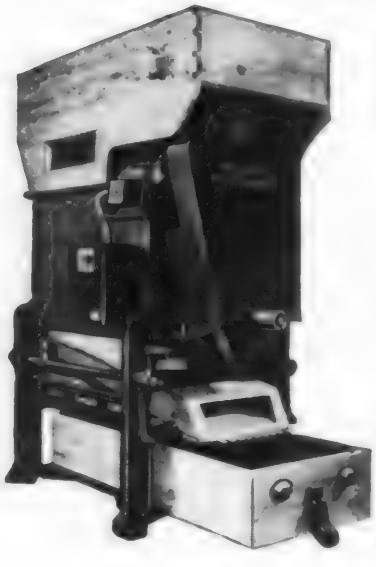

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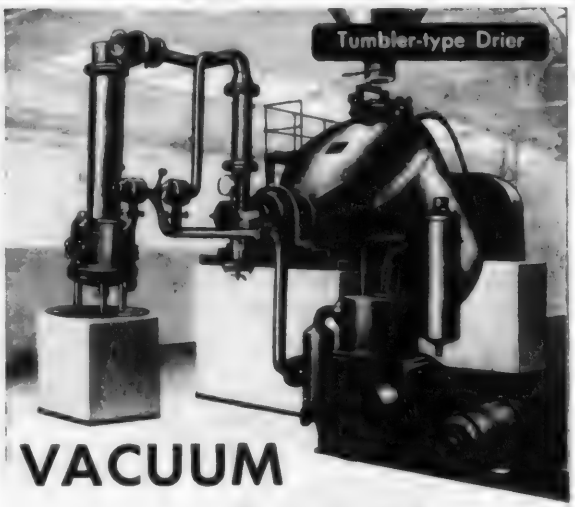

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COUNTER that Rising Cream Cost. " Cream-Master " Cream Whipping Machines will give you a minimum 25% saving and an improved non-weep cream. Let us send you full details. —Sorensens, 42, Raby Street, Manchester, 16.

SECOND-HAND PLANT FOR SALE

FOR re-built Refrigeration Equipment, all types and sizes, try Alfred's Ices (1954) Ltd., 1-5, Hall Place, Paddington, W.2. Tel.: PADdington 6619/10.

MELVIN 10 cwt. capacity Powder Mixing Machine, with " U " shaped trough size 50 in. by 36 in. by 40 in. Complete with 20 h.p. A.C. motor drive.—Details from C. Skerman and Sons Ltd., 118, Putney Bridge Road, S.W.15. Tel.: VANdyke 2406.

ROSE Brothers " Mayflower " Bar Foil Wrapping Machine for bars size approx. 4⅛ in. by 1⅛ in. by ⅞ in. thick, speed 110 per minute. Double wrap if required. Also Sapal Foiling Machine No. PRMG, speed 75 per minute. New 1958. Both machines in absolutely new condition throughout.—Details from C. Skerman and Sons Ltd., 118, Putney Bridge Road, S.W.15. Tel.: VANdyke 2406.

WANTED
DIESEL GENERATING SETS, DIESEL ENGINES AND MARINE ENGINES
from 30-2,000 h.p. Immediate cash settlement.
Particulars to:
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Telephone: Ashford 3349

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FIXED Beater Disintegrator by Christy and Norris, size 2½, rotor mounted in ring oil bearings with outboard pedestal, driven by flat pulley. Contact parts fitted renewable liners.

Atomill high speed Pulveriser by British Jeffrey Diamond, tapered feed hopper 32 in. by 32 in. by 22 in. deep, discharging to 3 in. worm feeder driven by ½ h.p. geared motor. Rotor fitted 12 swing hammers and driven by 15 h.p. 400/440/3/50 cycles motor through vee ropes. Approx. feed size 1 in., max. output up to ½ ton per hour when reducing to between 50 and 300 mesh.

Single-deck Reciprocating Screen by Christy and Norris, totally enclosed, surface area 5 ft. 6 in. by 2 ft. 8 in. with 16 mesh screen, quick release plywood cover. Timber feed hopper 34 in. by 19 in. by 24 in. deep. Vee rope drive from 1 h.p. 400/3/50 cycles motor with a starter.

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Vacuum Oven by Francis Shaw, cast iron construction, 5 ft. 2 in. wide by 8 ft. 9 in. long by 7 ft. high internally, heavy swing door each end with four corner wheel operated swing clamps, sight glasses, lamps and air cocks. Top and bottom flanged connections to internal headers with swan neck connections to platens. 17 steam heated plates of riveted construction 1¼ in. thick suitable 40 p.s.i. w.p. Daylight 3¼ in., effective platen width 60¼ in.

Turbo Simplex Drier by Tomlinson, 9 compartments each 7 ft. 6 in. deep by 2 ft. 9 in. wide by 5 ft. 10 in. high. Gilled steam tubes to each compartment. 100 p.s.i. w.p., 30 in. diam. air circulating fan to each compartment. Vertically totally enclosed Blue Glass-lined Vessel by Pfaudler, 3 ft. 6 in. diam. by 4 ft. deep. Dished top with hinged 18 in. diam. manhole, dished bottom with 1½ in. i.d. centre outlet and 1 in. i.d. side run-off. Four available.

Unused Timber Vat, 8 ft. diam by 8 ft. deep in 2¾ in. thick pine, with eight steel rod retaining bands. Vertical perforated filter trough fitted over outlet to within 12 in. of top. Two available.

Unused Mark 3Y10½ Ammonia Compressor by Sterne, three cylinder, 10½ in. diam. by 9 in. stroke, with 200 h.p. 380/3/50 cycles auto-synchronous motor with starting gear, etc. Two available.

Totally enclosed Single Deck Screen by Barron, 36 in. by 18 in. fitted with oscillating balls, mounted in brass chamber with timber lid and two sack outlets, f. and l. pulley drive.

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SONS & CO. LTD.
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DAMAGED or redundant stocks of food, residues or by-products in large or small quantities required.—Send your offers to Rotunda Foods Co., London Office: 50/52, Blandford Street, W.1. Tel.: Welbeck 8465.

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WELL-established printer of good repute willing—for specific reasons—to supply long runs of two colour repetitive work at single colour prices. Enquire G. F. Tomkin Ltd., 501/7, Grove Green Road, Leytonstone, London, E.11.

ADVERTISER, South Coast with local selling organisation, capital and premises suitable for the manufacture of Bakers' Sundries, wishes to contact man with new ideas and the " Know how " for the production of these lines.—Box B5937, *Food Manufacture*, 9, Eden Street, N.W.1.

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Residential Course

on

RECENT ADVANCES IN FOOD SCIENCE

5th—19th September, 1960.

Sponsored by The Low Temperature Research Station, Cambridge, The Torry Research Station Aberdeen and The Royal College of Science and Technology, Glasgow, a course will be held with the purpose of studying recent advances in Food Science with particular reference to the decade 1950-60. The programme is concerned both with commodities and processing and nine major food research organisations are co-operating in providing lecturers with special knowledge of individual topics. The Office of the Science Adviser of the North Atlantic Treaty Organisation has made funds available to assist a limited number of suitably qualified scientists from without the United Kingdom to attend free of residence and tuition fees. In special circumstances assistance with travelling expenses may also be granted. All lectures will be delivered in English.

Further information and forms of application may be obtained from The Department of Food Science, The Royal College of Science and Technology, Glasgow, C.1, Scotland. The Closing date for applications is Monday, 13th June, but since accommodation is strictly limited, early application is advised.

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FOUR New and Unused Leonhardt Apple Peeling and Coring Machines with automatic cutting device for slices and chunks.—Offers invited to Box B5939, *Food Manufacture*, 9, Eden Street, N.W.1.

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FIRST-CLASS Storage Accommodation available at Witham, Essex. New steel and concrete building, size 100 ft. by 30 ft. by 15 ft. providing very dry storage; three more buildings to be constructed shortly on same site; easy access to and from main A12 road to the East Coast; within three minutes of main line railway station. Road haulage firm on adjacent site. Ideal Storage Centre for Food Manufacturer. Enquiries invited.—Arnold Kahn, Maldon Road, Witham, Essex. Tel.: Witham 3140.

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PATENTS

THE proprietor of British Patent No. 717953, entitled *Apparatus for treating food products*, offers same for licence or otherwise to ensure practical working in Great Britain.—Inquiries to Singer, Stern and Carlberg, 14 E. Jackson Blvd., Chicago 4, Illinois, U.S.A.

THE Proprietors of British Patent No. 764136 for *Improvements in and Relating to a Device for Slicing Vegetables and the like* are desirous of entering into negotiations with firms in this country for the purpose of exploiting the above invention either by sale of the patent rights or by granting of licences to manufacture on a royalty basis.—Enquiries should be addressed to Abel and Imray, Quality House, Quality Court, Chancery Lane, London, W.C.2.

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PFAUDLER glass-lined Tanks, 1,700-gal., vertical on feet. Gravity Conveyors, rollers 18 in. and 14 in. wide with curves and stands, etc. Garrett 11 ft. by 4 ft. vertical Crosstube Steam Boiler, 800 lb. evaporation, 100 lb. pressure. Barford 12½ cu. ft. Steam Disinfestor.—A. H. Kimmins and Sons Ltd., Lyndhurst Road, Worthing.

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SOUTH Coast Port. 86,000 sq. ft. of Warehouse and Industrial Buildings, mainly single-storey on 3-acre Site. Deep Water Berth with 400 ft. wharf frontage. FREEHOLD FOR SALE.—Chamberlain and Willows, 23, Moorgate, E.C.2. Tel.: MET 8001.

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Please write to Managing Director,
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Used drums of all kinds and sizes. Collection by own vehicles. Details on request.
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is required to fill the position of Technical Studies Supervisor in one of Britains largest and most modern canning, quick freezing, and packaging factories.

The position is in the Production Division of the Company and involves managing a technical section. Applicants must have worked for several years in a process industry, carrying out investigations on the manufacturing scale. In addition they must have at least an appreciation of the application of statistical methods in the design of experiments; they must also demonstrate that they possess a flair for gaining the co-operation of other people.

Starting salary will be between £1,400 and £1,800 p.a.

There are non-contributory pension, sickness benefit and accident assurance schemes. Help will be given to find housing. Please address your applications to:—

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FATS and Oils (vegetable), surplus, purchased by L. R. Stevens, "Stella Maris," Dirtham Lane, Effingham, Surrey. Tel.: East Horsley 3229.

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REQUIRED in good condition, Camwheat Universal Pie Machine with depositor.—Box B5942, *Food Manufacture*, 9, Eden Street, N.W.1.

WANTED, Transwrap Machine.—Full particulars to Box B5944, *Food Manufacture*, 9, Eden Street, N.W.1.

WANTED, Rhubarb Slicing Machine, must be in good condition and reasonable in price.—Please give details of capacity, price, etc., to Box B5947, *Food Manufacture*, 9, Eden Street, N.W.1.

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Two Horizontal totally enclosed stainless steel Storage Vessels, 7 ft. long by 5 ft. i.d., fitted oval manway.
Three Vertical jacketed stainless steel Vessels, 3 ft. by 2 ft. 6 in. diam., fitted cover.
Two stainless steel Vessels, 3 ft. 6 in. diam., fitted steam coils.

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SONS & CO. LTD.
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FOR Sale: Complete Vacuum Drying Plant by Scott, comprising 23 ft. long by 4 ft. diam. agitated drier, feed hopper, elevators, worm conveyors, vacuum pump, condenser and all electrics, etc.—Reply Box B5951, *Food Manufacture*, 9, Eden Street, N.W.1.

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The Irish Sugar Company Ltd. is enlarging its Technical Staff and seeks applications from persons with an honours University Degree or equivalent qualification in:

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MATHEMATICS

The Company manufactures Sugar and Sugar Products at Carlow, Mallow, Thurles and Tuam. It is about to undertake the processing of fruit and vegetables and other foods.

The persons appointed will enter the scale £825 × £30 to £1,275 a year, which is the lowest rung of the promotion ladder. The point of entry will be determined according to experience, especially experience in some aspect of Food Processing. Free housing accommodation, fuel and light, or cash allowance in lieu, and a non-contributory pension scheme, are provided.

The upper age limit is 35.

Application Form and further details are obtainable from:—

Peter J. Murray,
Secretary.

Comhlucht Siúicre Eireann, Teo,
(Irish Sugar Company Ltd.)
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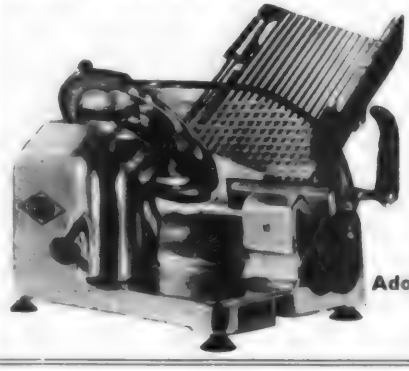

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I.S.I.S. Appointments Register

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I.S.I.S. is an organisation backed by a large industrial group of consultants with contacts in all the industries based on technology. As an addition to their present resources they have established this Appointments Register. Below will be found some of those technologists who are looking for further opportunities. Employers and Personnel Officers are invited to complete the form below, detach and send to the above address. In this particular instance the use of a form, with its attendant simplification of office systems, ensures speedier results for the employer.

Ref. A.415. Dutch. Male. Married. Age 37. M.Sc. Forestry and qualification equivalent M.Sc. Agric. 6 months Assistant Research Officer, Forestry Department. Several years as Agronomist with fertiliser and other agricultural chemicals firm, with considerable experience of field research in respect of fertilisation. Seeks similar post in England or Europe. (At present resident S. Africa.) Salary £1,200 p.a.

Ref. A.416. British. Male. Married. Age 39. M. of Purchasing Officers Assoc. and Assoc. M. of Inst. of Materials Handling. 1½ years Assistant Storekeeper, oil field exploration. 10 years Assistant Chief Storekeeper, oil field exploration, S. America. 2½ years Chief Storekeeper, mining (diamonds), Africa. Seeks appointment as Stores or Purchasing Officer/Stores Controller/Buyer/Chief Storekeeper, etc. Salary £1,500 p.a.

Ref. A.417. British. Male. Married. Age 41. F.R.I.C., Dip. in Chem. Engg. and Fuel Technology. 3 years Chemist, coal carbonisation. 3 years Research Chemist, organic chemical manufacturer. 7 years Fuel Technologist, ironfounders. 2 years Control Chemist, oil refiners. 10 years Chief Chemist, shipowners. Wide knowledge fuel industries, chem. plant operation and supervision, laboratory control and chemical matters associated with insect and vermin control. Seeks post as Chemist where previous wide experience an asset, London or Provinces. Salary £1,600 p.a.

Ref. A.418. British. Male. Married. Age 32. H.N.C. Mech. 1st Class M.O.T. combined steam and diesel. 6 years apprentice Fitter, cable works. 8 years Marine Engineer (sea going). 3 years Sales Engineer, manufacturers of fans and air equipment. Fair electrical knowledge and experience of heating, ventilating, dust extraction, sales and contracts. Seeks post as Engineer, preferably Marine (not sea going) or plant engineering. S. England, preferably London. Salary £1,100 p.a.

Ref. A.419. British. Male. Married. Age 32. 6 years Technician, pharmaceutical manufacturers. At present Senior Technician, physicial chemistry laboratory, pharmaceutical manufacturing chemists. Considerable research work on Vitamins. Very interested in writing and can show proof of ability in this field, and now seeks Technical Writing or Copy Writing post, preferably London, but would consider elsewhere. Salary £850 p.a.

Ref. A.420. Indian. Female. Single. Age 33. At present resident India. B.Sc., M.Sc., Ph.D. 1½ years Research Fellowship, medical research, London. 6 months Development work, for Indian division of U.K. drug manufacturing company. 4 years Junior Scientific Officer engaged in drug research in India. At present Senior Scientific Officer, engaged in research and development work in essential oil and perfumery raw materials. Five papers published, and two patents. Seeks post in London with Company dealing with essential oils and engaged in manufacture of perfumery raw materials, perfumes and cosmetics. Would be very interested in British Company who would later be manufacturing their products in India, where her experience and contacts could be used. London salary £1,000 p.a. min.

Ref. A.421. British. Male. Married. Age 45. Apprenticeship at aeronautical technical school. 1 year Author (electro-mechanical subjects), technical writing agency. 3 years Inspector, general engineers. 6 years Inspector, aeronautical engineers. 4 years Supervisory Inspector, aeronautical engineers. 8 years Assistant Examiner and Examiner, Ministry. At present engaged in assessment of mechanical (liability) state of defective equipment, with manufacturer of electronic equipment. Taking selling course with school of salesmanship. Seeks post as Representative or Technical Representative. Salary £900 p.a. approx., in London.

Ref. A.422. Dutch. Male. Age 41. Married. At present resident Malaya. Diploma of College of Tropical Agriculture. 3½ years Assistant Manager and 4 years Manager, rubber plantations. At present Manager of rubber plantation. Total of 14 years experience as rubber planter. Seeks suitable Executive or Supervisory Appointment in any country of the British Commonwealth, U.K. Salary £1,200 p.a., Australia £A1,500, New Zealand £NZ1,200, Tropics £2,000.

Ref. A.423. British. Male. Single. Age 61. Qualified Mech. Engr. 12 years Europe as Sales Engineer, smelter and rolling mills with coal mine. 3 years Sales Manager, London wholesalers and shippers in machinery. 4 years Export Manager, exporters and importers of ores, metals, minerals and machinery. 4 years Export Department, chemical manufacturers acid resistance and abrasion resistance. 4 years Liaison Officer, shipowners and shipping agents. At present engaged as Contract Engineer and Technical Translator and Extractor, with mechanical engineers, automatic controls, boilers, ships, etc. Fluent French, German, Italian and Spanish. Seeks appointment as Technical Executive where languages and business and office experience can be used. London area. Salary £750 p.a.

Ref. A.424. Indian. Male. Single. Age 26. B.E. (Chemical). Passed Assoc. Exams. of I.Mech.E.—special subjects Thermodynamics and Electrical Technology. 2½ years graduate apprentice, heavy inorganic fertiliser manufacturer. 5 months apprentice, paint and varnish manufacturer. At present Engineer in Technology Department, research, development and design of heavy inorganic chemical fertiliser plants. Seeks post as Research Assistant in laboratory or as Design and Development Engineer process plant and equipment U.S.A., U.K., Canada, Germany, Aden or Persian Gulf. U.K. salary £500 p.a. U.S.A. salary 150 dollars per month.

Ref. A.425. South African. Male. Age 35. B.Sc. (Eng.). Chemical Engineer. 2½ years Chemist, soap manufacture. 1½ years Departmental Manager, soap manufacturer. 3 years Assistant Works Manager, genera l chemicals. 6 years Senior Technical Officer, safety consultants. At present Production Manager, soap manufacturers. Seeks post as Works Manager or Safety Officer, London or Provinces. Salary £2,000 p.a.

Ref. A.426. British. Male. Married. Age 49. B.Sc., F.R.I.C. 19 years Research Chemist and Plant Manager, chemical manufacturers. 7 years Research and Development Chemist, chemical manufacturers. 1 year Analyst and Assistant Manager engineering Company. At present Technical Manager, chemical manufacturers. Seeks Technical Management, Design, Technical Service or Sales post. Salary £1,500-£2,000 p.a. min. Midlands only, preferably Birmingham.

Ref. A.427. Indian. Male. Single. Age 30. At present resident Italy. B.Sc.Agric.Eng., Agric. College Dip. in Agric. Eng. 2 years i/c Farm, soil conservation department. 2 years Field Test Engineer, manufacturers of tractors and farm machinery. At present engaged in study of mechanisation of paddy cultivation in Italy. Seeks Research post in Agric. Engg., or as Technical Representative for manufacturers. Salary £1,000 p.a. approx.

Ref. A.428. British. Male. Married. Age 34. H.N.C. 1st and 2nd Class M.O.T., Assoc.M.Inst. of Engrs. and Shipbuilders. 3 years Engineer Lt., R.N. 6 years Chief Engineer, Merchant Service. 1 year Assistant Works Engineer electronics. 1 year Assistant Designer, research and development-marine engine builders. 1 year Assistant Works Engineer, steel makers. 2 years Design Engineer, steel makers. Seeks post as Works Engineer or Project Engineer, area West London to Reading. Salary £1,500 p.a.

Ref. A.429. British. Male. Married. Age 34. National Cert.—Chemistry. 5 years Plant Shift Chemist, chemical manufacturers. 13 years Senior Scientific Officer, electrical engineers, in charge of large materials testing laboratory. Experienced in production of Chemical intermediates, technical control of electric power cable manufacturer, development and research of electric accumulators and laboratory testing all material used in electrical engineering. Seeks Technical Managerial/Administrative/Sales Appointment. Preferably S. England. Salary £1,400 p.a.

Ref. A.430 American. Male. Age 45. Married. B.A., M.Sc.Ph.D. 5 years Professor in Agronomy, State Agricultural College, U.S.A. 2½ years Soil Scientist, philanthropic foundation. 7 years Soil and Fertiliser Technologist, government department

[Continued overleaf

To: I.S.I.S. Appointments Register, 9, Eden Street, London, N.W.1. Please ask the following applicants to communicate with the undersigned:

Ref.:_____	**Ref.:**_____	**Ref.:**_____	**Ref.:**_____
Ref.:_____	**Ref.:**_____	**Ref.:**_____	**Ref.:**_____
Ref.:_____	**Ref.:**_____	**Ref.:**_____	**Ref.:**_____

Please use Block capitals

Name: _____

Position: _____

Company: _____

Business or Profession: _____

Address: _____

All introductions are made on the understanding that should an engagement result the employer agrees to I.S.I.S. Appointments Register's terms, which are as follows:

For each person engaged the equivalent of one weeks salary payable by the employer within fourteen days of the date of engagement.

Signature_____ Date_____

I.S.I.S. APPOINTMENTS REGISTER (Continued from overleaf)

of agriculture. 6 months Soil Surveyor. At present Chief Agriculturist, chemical manufacturers. Seeks post as Agricultural Director, with salary equivalent 15,000 U.S. dollars.

Ref. A.431. British. Male. Married. Age 53. B.A., Dip.Agric., A.R.I.C. At present resident Africa. 10 years Assistant to soil chemist, agric. research station. 4 years Assistant Government Chemist (food and drug chemist), medical department. 3 years Government Chemist (Agricultural Chemist), agric. department. At present Government Chemist (Senior Soil Chemist). Seeks appointment connected with soils, fertilisers or crop nutrient deficiencies U.K.—provinces preferred.

Ref. A.432. British. Male. Married. Age 35. B.Sc. Botany with Agric. Botany, Subs. Agriculture and Agricultural Chemistry. M.I.Biol. 2½ years Scientific Officer, agric. research. 1 year Agricultural Technical Officer, crop protection. At present Head of agricultural technical department concerned with development and technical marketing of crop protection chemicals. Seeks appointment in the development or technical marketing of agricultural chemicals. Preferably London or Provinces, but would also consider abroad. Salary £1,600-£1,800 p.a.

Ref. A.433. British. Male. Married. Age 32. B.A. (Chem. with Biochemistry) and B.Sc. 1 year Demonstrator, university. At present Chemistry Section Head, pharmaceutical manufacturer, responsible for all antibiotic extraction processes, from the end of the fermentation processes to the bulk final products, with respect to their development, and problems which arise in routine working of the production plant and working in liaison with the biochemical and pharmacological sections. Seeks Senior position in Development, Fine Chemicals/Pharmaceutical manufacturer, Provinces or London. Salary £1,850 p.a.

Ref. A.435. British. Male. Married. Age 36. 9 years Print and Block Buyer and then Purchasing Manager, lampshade manufacturer. 3 years Assistant to Managing Director, printers. Took 3-year course at school of photo-engraving and lithography. Seeks post as Purchasing Manager (experience in purchasing steel sheets and strip, plastics, and other raw materials and satisfying production needs of factories) or Administrative post with Printers, or as Representative for Printers. London or S.E. England. Salary £800 p.a.

Ref. A.436. British. Male. Single. Age 28. B.Sc. (Eng.) Metallurgy. 3 years in Aero Metallurgy Division, atomic energy. At present Senior Development Metallurgist, manufacturer of large steam turbines. Interested in electronics. Seeks post as Metallurgist, on or near south coast of England or in London. Salary £1,200 p.a.

Ref. A.437. British. Male. Married. Age 39. B.Sc., Ph.D., F.R.I.C., F.R.A.C.I. 3 years Control Chemist, edible oils, soap. 5 years Chemist, explosives. 4 years Senior Research Chemist, organic chemicals. 7 years Departmental Head, pharmaceuticals, starch, household products. At present Technical Director, flour, starch, protein. Now resident abroad but seeks post in U.K. as Technical Executive.

Ref. A.438. British. Male. Married. Age 35. Engg. Diploma equiv. H.N.C., Grad.I.Mech.E. 8 months Application Engineer, industrial instruments. 6 years Sales Engineer, high vacuum equipment. 4 years Technical Assistant, plant maintenance, general engineering and steel fabrication. National Service included 1½ years Electrician and 1½ years Education Instructor. At present Contracts Engineer, industrial instrumentation. Seeks post as Sales Engineer, London. Commencing Salary £900/£1,000 p.a.

Ref. A.439. British. Male. Single. Age 36. Hons. Degree in Botany. Some study of Chemistry Experience includes 1 year Forestry. 1 year Self-employed, botanical survey—results published. 2 years Microscopist, coal research. 4 years work on training courses, exhibitions and abstracting technical papers, paint research organisation. Seeks post in technical information, or Exhibitions: construction and demonstration, or Training Course Organisation. London, or within 80 miles radius of London. Salary £800 p.a.

Ref. A.440. British. Male. Married. Age 48. A.R.C.S. and B.Sc. (both 1st class Hons. Chemistry). Ph.D., D.I.C., F.R.I.C. Chemist-in-Charge of Production, later of Development (Research), Admiralty Scientific Service. 1 year own business, manufacturing chemists. 5 years Works Chemist, oils manufacturers. At present General Works Manager, soft drinks manufacturers. Fluent Spanish and French and some German. Knows intimately Essential Oils industry of France and Spain and the Citrus Juice industry of Spain. Seeks appointment as General Works Manager, or related position, London, Home Counties or Spain. Salary £2,250 p.a. approx.

Ref. A.441. British. Male. Married. Age 41. Diploma in Mech. Engg. A.M.I.Prod.E. 4 years Designer, high speed diesel manufacturer. 2 years Designer, machine manufacturer. 6 years Leading Designer, high-speed diesel manufacturers. 3 years Chief Designer, machine tools manufacturers. At present Chief Design Engineer of Production Equipment, manufacturer of technical ceramic components. Seeks post as Chief Designer, U.K., Peterborough or Letchworth area preferred. Salary £1,700 p.a.

Ref. A.443. British. Female. Married. Age 21. G.C.E. A Level Pure and Applied Maths., Chem. and Physics and 1 year University (Special Maths.). 6 months Statistical Assistant, operational research. 2½ years Heat Exchanger Designer, heat exchanger manufacturer. Now seeks similar post or anything with mathematical work. London. Salary £700 p.a.

Ref. A.444. British. Male. Married. Age 27. 5 years Apprentice. 2½ years. Production Engineer Foreman, Electric/Mechanical Instruments, in charge of the instrument section of company engaged in production of all types of precision mechanical devices, including prototype work. Seeks post North London or S. Herts., as Production Engineer Foreman. Salary £850 p.a.

Ref. A.445. British. Male. Single. Age 33. Inter.B.Sc., Chem., Pure Maths. and Applied Maths. 2 years Laboratory Assistant, brewing. 5 years Laboratory Assistant, textile research. 3 years Research Assistant, coal tar research. At present Research Chemist, coal tar distillation. Seeks Chemical Laboratory Work appointment U.K.—preferably Yorkshire, or N.W., S.W. or S.E. England (not London). Scotland or N. Ireland.

Ref. A.446. British. Male. Married. Age 37. B.Sc. (Mech. Engg.). 1 year Research Engineer, mechanical engineering. 3 years Driller, oil industry. At present Assistant Drilling Superintendent, oil industry. Seeks Senior Staff post abroad—any country—salary £1,500 p.a. basic.

Ref. A.447. British. Male. Married. Age 31. M.A., B.Sc., A.R.I.C. Studying for membership British Institute of Management. 8 years Materials and Process Development Engineer, precision engineering. At present Chief Chemist, Rubber and Plastics. Seeks Technical Management appointment, with some sales and management content. S. or W. England. Salary £1,750 p.a.

Ref. A.448. British. Male. Single. Age 24. H.N.C. (Chemistry). 4½ years Laboratory Assistant, copper smelters. At present Chemist, manufacturers of products used in petroleum industry. Experience in spectroscope (visible and infra red), paper chromatography and other instrumental techniques, and metal analysis. Seeks post preferably as Analyst but will consider any position where scientific training is advantageous. S. or Central America. Salary £1,000 p.a.

Ref. A.449. Indian. Male. Married. Age 37. B.Sc. and M.Sc. (Chemistry), B.Sc. (Chem. Engg.), Assoc. M.Inst. Chem. Engg. (London), A.M.I.Chem.E. At present resident India. 4 years Apprentice and Shift Foreman, nitrogenous fertilizer factory. 3 months Demonstrator in Chemical Engineering and 2 years Lecturer in Chemistry, university. 3½ years Lecturer in Chemical Engineering, higher technical institute. At present Training Officer (Chemical Engineer), nitrogenous fertilizer manufacturer. Seeks process or Project Engineer, or Chemical Plant Design work post, connected with chemical fertilizer industry or high pressure or petroleum refining, preferably with British company in India, or London or Canada. Salary £1,000 p.a.

Ref. A.450. British. Male. Married. Age 58. Ph.D. (Doctor in Chemistry). 4 years Assistant to Professor, scientific institute. 10 years Chief Chemist, milling and bakery. 5 years Research Chemist, ind. emulsions. 5 years Chief Chemist, cosmetics and toilet preparations. 5 years Chief Development Chemist, pharmaceuticals. Fluent German and some French. Articles published in leading journals on cosmetics and pharmaceuticals. Originator of British patents. Seeks post, London area, as Executive Development Chemist (preferably Cosmetics). Salary £2,000 p.a. minimum.

Ref. A.451. Indian. Male. Married. Age 35. Resident U.K. B.Sc. (Chemistry), B.Sc.Tech. (Chemical Technology), F.R.I.C. 4 years Chemical Engineer i/c Production, pharmaceutical manufacture. 6 months Chief Analyst, Industrial Research. 2½ years Production Control and Distribution Manager, pharmaceutical manufacturer. At present Manager, process development, pharmaceutical manufacture. Seeks Chemical Production/Development/Administration appointment. U.K., E. Africa, India, Far East, Salary £1,500 p.a. minimum. Would consider employment with patent agency or industrial consultants.

Ref. A.452. S. African. Male. Single. Age 27. B.Sc., M.Sc., Ph.D. (thesis in Organic Chemistry). 6 months Chemist, chemical industry. 9 months Quality Control Analyst, motor assembly plant. At present Stock Control Engineer, oil company. Seeks post in Chemical Concern or Oil Refinery, where training in chemistry will be useful and lead to rapid advancement, U.K., U.S.A., Canada. Salary £1,500 p.a. minimum.

Ref. A.453. Indian. Male. Single. Age 22. At present living in India. Diploma in Draughtsmanship. At present Mechanical Draughtsman, design and erection of chemical plants. Seeks appointment as Mechanical Draughtsman, preferably England or Canada. Salary £600 p.a.

Ref. A.454. British. Male. Married. Age 46. 18½ years. Toolmaker, electrical engineer 2½ years. Toolmaker and 2½ years Toolroom Foreman, instrument makers. 7½ years Assembly Shops Superintendent, Electrical Engineering. Toolroom experience includes design and manufacture of press tools, gauges, jigs and fixtures, die casting and injection moulding. Production Experience includes control and supervision of several shops, foremen and large mixed labour force, with responsibility for quality discipline and job cost, and experience of quality control methods, labour selection by psychological tests, standard costing and budget control. Seeks post as Production Engineer or Assistant Works Manager, London or Southern Provinces. Salary £1,050 p.a.

Ref. A.455. British. Male. Married. D.Sc. (Zurich), B.Sc. London, A.R.C.S.T., F.R.I.C. Can read freely Russian, French and German. Experience includes 4 years Research Chemist, War Office. Has worked on factory scale with nuts and almonds. Has manufactured Permanent Waving Reagents. Granted government licences to manufacture and sell own pest control preparations. British patent on bleaching of flour and two patents on electric transformers and has carried out much work on primary electric batteries. Seeks appointment four days per week, in or near London, as Organiser of Team and Supplier of Ideas. Salary £1,750 p.a.

Ref. A.456. British. Male. Married. Age 25. H.N.C. (Mech.) C. and G. Instrument (Intermed.). 9 years from Apprentice to Chief Estimator and Technical Correspondent, industrial instruments. Radio operator with I.G.Y. expedition. Seeks post as Estimator, Representative or Contract Engineer. London or N. England. Salary £900 p.a.

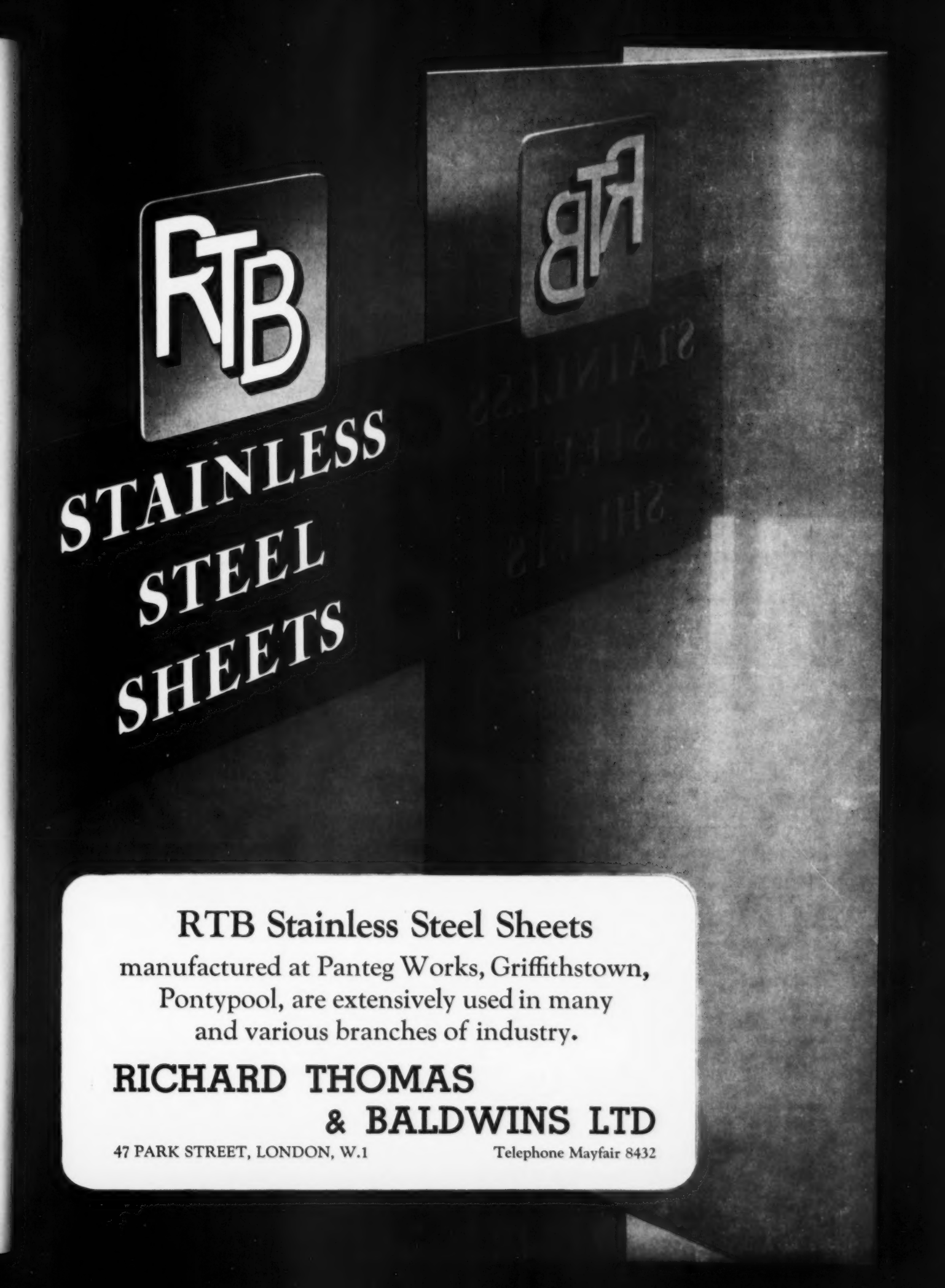
Ref. A.457. British. Male. Married. Age 33. Inter B.Sc., L.I.M. 13 years from Laboratory Assistant to Assistant to Chief Metallurgist, ferrous and non-ferrous nut and bolt manufacturers. At present Research Metallurgist, non-ferrous metals and compounds, paints—ceramics. Wide metallurgical experience includes physical testing, metallography, chemical and physical analysis (spectrographic), control of works processes—heat treatment, metal finishing, material selection, etc. Seeks post as Chief Metallurgist or Chemist or Assistant to Chief—with prospects. U.K.-S. England preferred. Salary £1,100/£1,300 p.a.

Ref. A.459. British. Male. Married. Age 59. Cert. in Chemical Science, equiv. Ext. B.Sc. 4 years Works Superintendent and Safety Officer. 8 years Technical Officer (Chemist), 5 years Works Superintendent and 2 years Research Assistant—explosives manufacture. 1 year Assistant to Chemist in Charge Nitrocellulose and 4 years Chemist in Charge—paint manufacture. At present Industrial Safety Officer (Research and Development)—manufacturer of explosives. Knowledge of Technical French and German, experience with Scientific Library Work, searches of literature, report writing, technical information. Seeks post as Industrial Safety Officer of Works Chemist, London or Provinces. Salary £1,200 p.a.

Ref. A.460. Dutch. Male. Married. Age 32. Master of Science degree in Tropical Agriculture. Member of Royal Society of Agricultural Science in the Netherlands. 7 years Experience in basic and applied research (agricultural). Speaks English, German, Spanish, Dutch and reads French. At present Chief Agronomist on sugar estate. Now seeks agricultural position in industry—not on a plantation—preferably in agricultural chemicals, fertilizer or food industry. Abroad—Europe or Western Hemisphere.

Ref. A.461. British. Male. Married. Age 37. H.N.C. 3 years Apprentice Fitter, steelworks machine shop. 5 years Draughtsman, H.M. Forces. 4 years Technical Sales Manager, chemical Merchants. 6 years Engineer, process plant dealers. At present Reconditioning and Sales Engineer, 2nd hand Chemical, Rubber and Process Plant. Seeks post as Maintenance Engineer, U.K. or Colonies. Salary £1,000 p.a.

Ref. A.462. Indian. Male. Single. Age 26. B.Sc. (Agric.). At present resident India. 6 months practical training in all the branches of Agriculture at horticultural research station and jute seed multiplication farm. At present employed in directorate of agriculture. Seeks post U.K. or U.S.A. as Apprentice-Trainee, willing to take further training in any branch of Agriculture, preferably in Agronomy, Plant Protection, Dairying or Horticulture.



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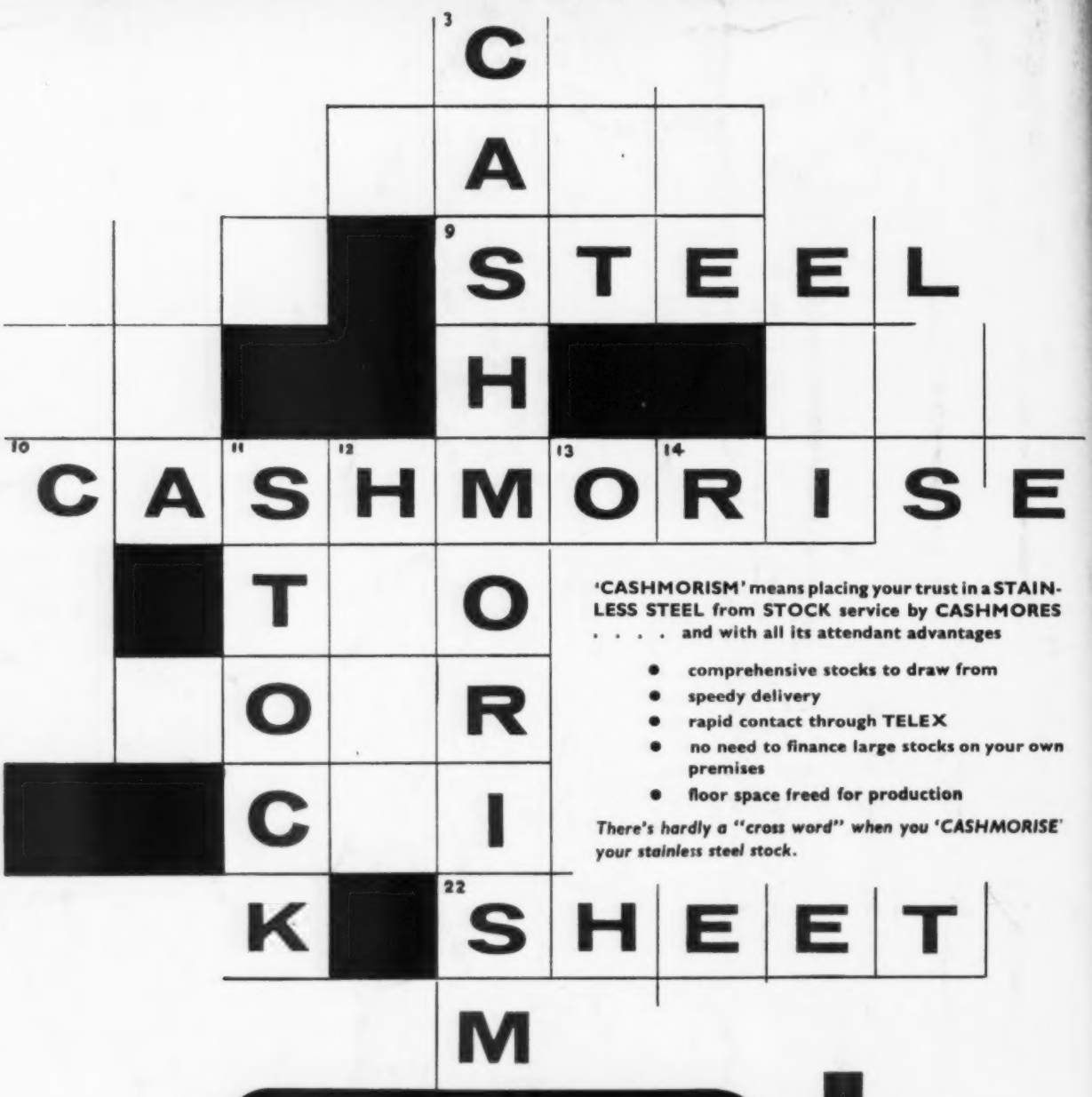

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